海南师范大学

Hainan Normal University

The 24th International Workshop on Matrices and Statistics

May 25-28,2015

Sponsor:Hainan Normal University

Haikou,Hainan,China

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PREFACE

On behalf of the International Organising Committee (IOC) it is my pleasure to welcome you to this, the 24th International Workshop on Matrices and Statistics.

The IOC is extremely pleased to be meeting here in Haikou, Hainan, the second time that the IWMS has met in China. In both cases I have had the honour to be the Chair of the IOC and it has been a excellent experience in working with the Local Organising Committee (LOC). The offer to host the IWMS in Haikou was made by Professor Chuanzhong Chen and I was grateful that he offered to chair the LOC. He has been an excellent colleague to work with and the Secretary Mrs Li Wang has been very efficient and supportive, handling many activities including the website, registration, and accommodation arrangements. Thank you Chuanzhong and Wang Li – your contributions to the efficient running of this workshop are very much appreciated.

For this Workshop, the IOC instituted a new procedure. We arranged that the Program would feature a number of Mini-Symposia with, initially, the IOC members each taking on the role of organizing one of the Mini Symposia. It was felt that the aims of the workshop of facilitating research in the various different strands of matrices and statistics would be better served by bringing together active researchers in cognate fields so that they could interact more successfully. We received offers of help from others to assist in facilitating these aims. In particular I am very grateful for the offers from Professor Kai-Tai Fang, Professor Shuangzhe Liu, Professor Jianxin Pan, Professor Tsung-I Lin and Dr Kimmo Vehkalahti to each organize a separate mini-symposium or special session. In addition we asked Professor Yonghui Liu to be of assistance due to his experience as Chair of the LOC for the IWMS-2010 held in Shanghai. These members plus Professor Chen and the members of the IOC formed the Scientific Program Committee. This arrangement worked very well and I would personally like to thank each one of them for the contributions that they have made securing an excellent spread of researchers in their respective Mini-Symposia.

Behind this activity, I personally have been very grateful for the constant assistance and prodding from Dr Simo Puntanen. This Workshop, and in fact the continuation of the series of these Workshops, has been greatly enhanced by Simo's dedication to see that things are done right and in a timely manner so I offer to Simo my very warmest and sincere thanks for all that he has done. We have been in contact on almost a daily

basis, often with multiple emails, for the past few months ensuring that the Workshop will be a success.

The setting up of a Pre-Workshop proceedings, that we later renamed as the IWMS 2015 Souvenir Booklet, is a new innovation for the Workshop and I am grateful for Professor Kai Tai Fang not only for his financial support to get this underway but also the technical support given by Professor Zhou Yong-Dao.

The program has also been influenced with the presence of a number of Plenary Speakers. In particular, I am grateful to ILAS, the International Linear Algebra Society, who provided support for an ILAS Lecturer, accepted by Professor Karl Gustafson. We were also anxious to see that statistical computing featured in the Workshop and I am grateful to the support of SAS for funding the participation of Dr Chris Gotwalt. I must also mention that when I delved into Chinese academic figures it became clear to me, as an applied probabilist, that Professor Mu-Fa Chen has had a major influence in this area in China. Through his writings he has made known to the Western world much of the research in this area that has originated in China. I am personally grateful for his acceptance as a Plenary Speaker. Without specifically mentioning names, we also appreciate the contributions made by the other Plenary speakers, suggested by members of the IOC .

This Workshop has two significant milestones that it is celebrating. Firstly Professor Kai-Tai Fang who is celebrating his 75th Birthday this year and Simo Puntanen who is celebrating his 70th Birthday. Both of these figures have made significant contributions to the field of "Matrices and Statistics" and it is very appropriate that we honour their contributions. Congratulations on these milestones Kai Tai and Simo. We look forward to the sessions honoring your contributions.

I need also to acknowledge the School of Computer and Mathematical Sciences at Auckland University of Technology. Through my part-time employment with the School I have been freed from teaching duties to give me the time to assist with the organization of this Workshop. I am very grateful for their support.

There are many people behind the scenes that emerge during the Workshop unbeknown to me at this time but to all of them I wish to express my appreciation for tasks well done in a cheerful and gracious manner. Thank you one and all and now let the show begin!

Jeffrey J. Hunter
Chair, International Organising Committee
24th International Workshop on Matrices and Statistics

International Organising Committee:
Jeffrey J. Hunter (New Zealand), (Chair), Simo Puntanen (Finland) Vice-chair), George P.H. Styan (Canada) (Honorary Chair), S. Ejaz Ahmed (Canada), Augustyn Markiewicz (Poland), Goetz Trenkler (Germany). Dietrich von Rosen (Sweden), Julia Volaufova (U.S.A), Hans Joachim Werner (Germany).

Scientific Program Committee:
Jeffrey J. Hunter (New Zealand), (Chair), Simo Puntanen (Finland) Vice-chair), S. Ejaz Ahmed (Canada), Chuanzhong Chen (China), Kai Tai Fang, (China), Shuangzhe Liu, (Australia), Jianxin Pan (United Kingdom), Augustyn Markiewicz (Poland), Goetz Trenkler (Germany). Dietrich von Rosen (Sweden), George P.H. Styan (Canada), Tsung-I Lin(Taiwan), Kimmo Vehkalahti (Finland), Julia Volaufova (U.S.A), Hans Joachim Werner (Germany). Yonghui Liu (China),

Local Organising Committee :
Chuanzhong Chen, (Chair), Li Wang (Secretary).

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Website:http://iwms2015.csp.escience.cn/dct/page/1

IWMS ABSTRACT BOOKLET

Welcome from the IOC Honorary Chair

As the Honorary Chair of the International Organizing Committee (IOC) of the "International Workshop on Matrices and Statistics" (IWMS) series, I would like to extend a special welcome to all the participants in this 24th IWMS in Haikou City (Hainan Province), China.

We are most grateful to Chen Chuanzhong, Chair of the Local Organizing Committee (LOC) and to Jeffrey J. Hunter, Chair of the IOC, for putting together such an excellent programme. Many thanks go also to Kai-Tai Fang, who at the Toronto IWMS suggested to me that we might hold this 24th IWMS in China. Special thanks go to Simo Puntanen (Vice-Chair IOC, Haikou-IWMS), whose encouragement and support of the IWMS series has now extended continuously for over 25 years!

International meetings play a key role in academic advancement. The Haikou-IWMS organizers now offer us an excellent opportunity for scientific communication and thereby provide a highly important and valuable service to the academic community.

It is hard to believe that over twenty-five years have passed since George and Evelyn Styan visited Shanghai and Beijing in 1988. In Beijing, Fuzhen Zhang was their host and ten years later he chaired the LOC for the 7th IWMS held in Fort Lauderdale, Florida, December 1998, in celebration of T. W. Anderson's 80th birthday.

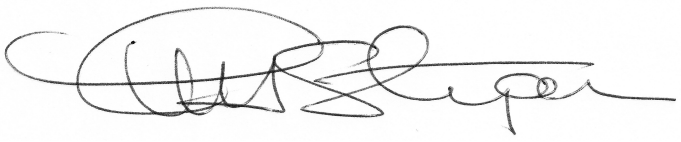
Fuzhen introduced George to the work of Loo-Keng Hua (1910–1985), and a research paper on Hua's matrix equality based on our joint work (also joint with Christopher C. Paige and Bo-Ying Wang) presented at the 8th IWMS in Tampere, Finland, August 1999. This research was published in the *Journal of Information & Systems Sciences,* vol. 4, no. 1, pp. 124–135 (2008).

In his keynote address at the 22nd International Workshop on Matrices and Statistics in Toronto (IWMS-2013), Kai-Tai Fang discussed the 13th-century Anxi iron-plate doubly-classic 6×6 bordered magic square. This motivated the research by Ka Lok Chu and me which is to be presented in the Minisymposium on Magic Matrices at this Haikou-IWMS.

We would like to extend a special welcome to new researchers in matrices and statistics, particularly those who are participating now in an IWMS for the very first time. I believe that there have been students who discovered topics at an IWMS which led to a thesis for an MSc or PhD degree and we hope that there will be many more.

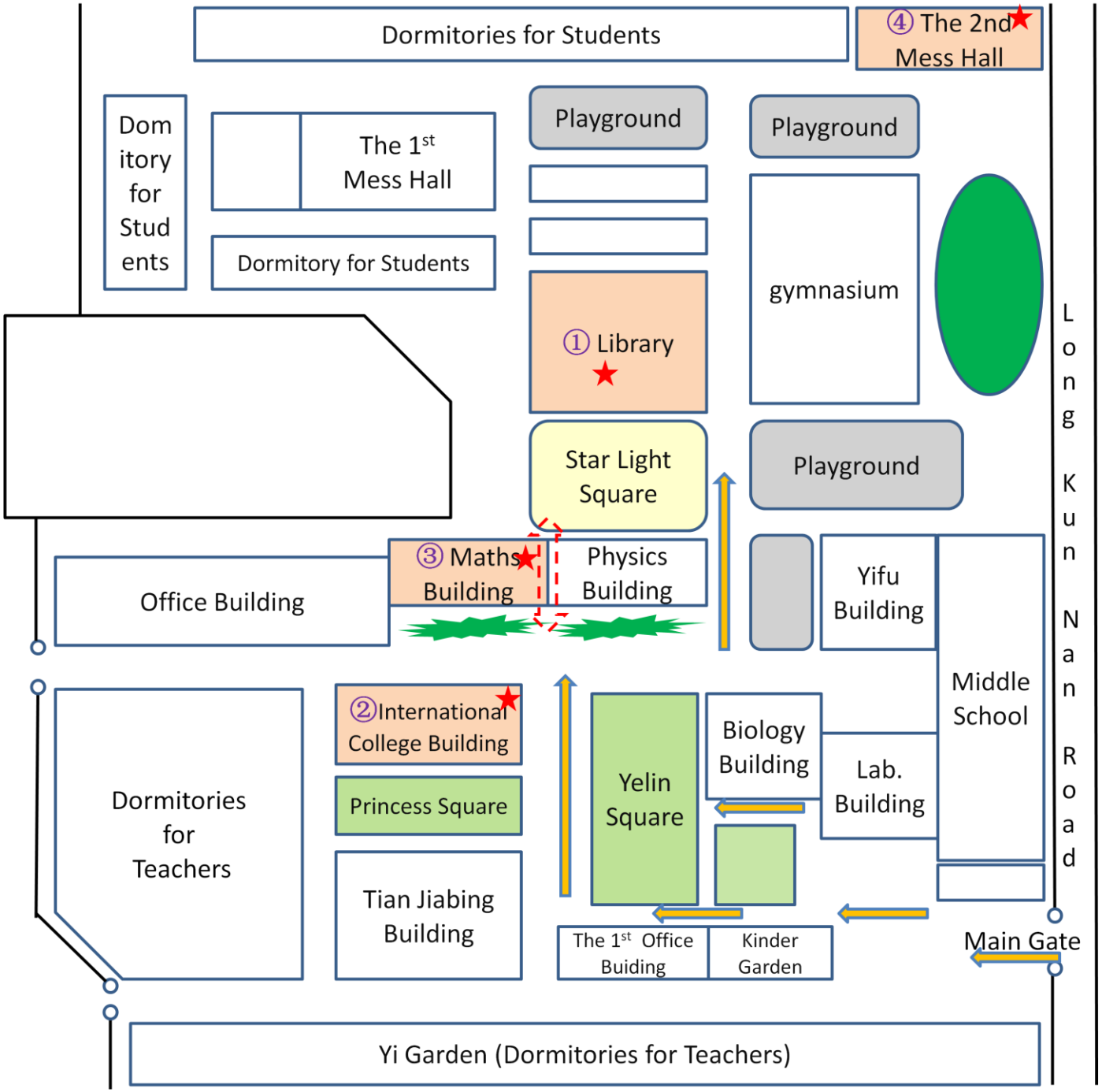
We look forward, in particular, to meeting here in Haikou at this 24th IWMS many young enthusiastic researchers in matrices and statistics. We older participants hope that youngsters will also experience the joy of working with matrices and statistics from which we have benefitted so much these past several years.

Welcome!



April 29, 2015

George P. H. Styan, Professor Emeritus of Mathematics and Statistics
McGill University, Montréal (Québec), Canada: geostyan@gmail.com



IWMS 2005

① **Venue A**: reporting room, 10th floor, library

② **Venue B**: reporting room 101, international college building

③ **Venue C**: reporting room, 3rd floor, maths building

④ **Dinning**: dinning room on the 2nd floor of the 2nd Mess Hall

Schdule

Monday, 25 May 2015

Opening Session
Venue: A (Reporting Room,10th floor, Library)
Monday, 08:30-09:00
Followed by Group Photo

Plenary Session 1
Venue: A (Reporting Room,10th floor, Library)
Monday, 09:00-09:40
Chair: Jeffrey J. Hunter

09:00-09:40 Ravindra B. Bapat (Indian Statistical Institute, New Delhi,India)
Moore-Penrose inverse of a Euclidean distance matrix

Invited Special Session Honoring Kai-Tai Fang's 75th Birthday
Venue: A (Reporting Room,10th floor, Library)
Monday, 09:40-12:30
Organizer and Chair: Jianxin Pan

09:40-10:10 Jianxin Pan (U of Manchester, UK)
Career synopsis of Professor Kai-Tai Fang

10:10-10:30 Tea Break

10:30-11:00 Runze Li (Penn State U, University Park, PA, USA)
Joint likelihood estimation for joint modeling survival and multiple longitudinal processes

11:00-11:30 Min-Qian Liu (Nankai U, Tianjin City, China)
Professor Kai-Tai Fang's contributions to Uniform Designs

11:30-12:00 Dietrich von Rosen (Swedish U of Agriculture, Uppsala, and Linköping U, Sweden)
Partial least squares and multivariate linear models

12:00-12:30 Jianxin Pan (U of Manchester, UK)
Regularization of covariance structures

12:30-14:30 Lunch **(The 2nd floor of the 2nd Mess Hall)**

Plenary Session 2
Venue: A (Reporting Room,10th floor, Library)

Monday, 14:30-15:10
Chair: Jeffrey J. Hunter

14:30-15:10 Chris Gotwalt, SAS Lecturer (SAS Institute Inc, Cary, NC, USA)
Firth estimation in the mixed model: a new derivation of REML and improved estimates and inferences using logistic models with random effects

MS5. Statistical Modeling and Computation
Venue: A (Reporting Room,10th floor, Library)
Monday, 15:10-18:30
Organizer: Tsung-I Lin
Chairs: Tsung-I Lin 15:10-16:10; Wan-Lun Wang 16:30-18:30

15:10-15:40 Wan-Lun Wang (Feng Chia U, Taichung, Taiwan)
Mixtures of common factor analyzers for high-dimensional data with missing values

15:40-16:10 Jyrki Möttönen (U of Helsinki, Finland)
Robust adaptive multivariate LAD-lasso

16:10-16:30 ***Tea Break***

16:30-17:00 Liucang Wu (Kunming U of Science and Technology, Kunming,China)
A skew-normal mixture of joint location, scale and skewness models

17:00-17:30 Jianhua Zhao (Yunnan U of Finance and Economics, Kunming, China)
Efficient model selection for mixtures of probabilistic PCA via hierarchical BIC

17:30-18:00 Zhengyuan Zhu (Iowa State U, Ames, IA, USA)
Modeling nonstationary processes on sphere using kernel Convolution

18:00-18:30 Tsung-I Lin (National Chung Hsing U, Taichung, Taiwan)
Mixture of skew-normal factor analysis models

18:30-19:30 ***Banquet***
(The 2nd floor of the 2nd Mess Hall)

MS2. Statistical Simulation
Venue:B (Reporting Room 101, International College Building)
Monday, 16:30-18:30
Organizer and Chair: Kai-Tai Fang

16:30-17:00 Ping He (BNU-HKBU United International College, Zhuhai, China)
Principle points and its application in simulation for univariate asymmetric distribution

17:00-17:30 Jiajian Jiang (BNU-HKBU United International College, Zhuhai,

China)
An extraordinary property of the arcsine distribution

17:30-18:00 Min Zhou (Hong Kong Baptist U, Hong Kong)
Representative points of univariate distribution in statistical simulation

18:00-18:30 Yong-Dao Zhou (Sichuan U, Chengdu, China)
Randomized likelihood sampling

18:30-19:30 Dinner **(The 2nd floor of the 2nd Mess Hall)**

Tuesday, 26 May 2015

Plenary Sessions 3-4
Venue: A (Reporting Room,10th floor, Library)
Tuesday, 08:50-10:10
Chair: Hans Joachim Werner

08:50-09:30 Karl Gustafson, ILAS Lecturer (U of Colorado, Boulder, CO, USA)
Antieigenvalue analysis, new applications: Continuum Mechanics, Economics, Number Theory

09:30-10:10 Yoshio Takane (U of Victoria, BC, Canada)
Professor Haruo Yanai and multivariate analysis

10:10-10:30 Tea Break

Invited Special Session Honoring Simo Puntanen's 70th Birthday
Venue: A (Reporting Room,10th floor, Library)
Tuesday, 10:30-12:30
Organizer and Chair: Julia Volaufova

10:30-11:00 Simo Puntanen (U of Tampere, Finland)
Where have all those 70 years gone?

11:00-11:30 Stephen J. Haslett (Massey U, Palmerston North, New Zealand)
Positive semidefiniteness of estimated covariance matrices in linear models for sample survey data

11.30-12:00 Kimmo Vehkalahti (U of Helsinki, Finland)
From Helsinki to Haikou via Istanbul and Nokia

12:00-12:30 Ka Lock CHU (Dawson College,Westmount,QC,Can)
An indexed illustrated bibliography for Simo Puntanen in celebration of his 70th birthday

12:30-14:30 Lunch **(The 2nd floor of the 2nd Mess Hall)**

Plenary Session 5
Venue: A (Reporting Room,10th floor, Library)

Tuesday, 14:30-15:10
Chair: Mu-Fa Chen

14:30-15:10 Zhi Geng (Peking U, China)
Causal effects and causal networks

MS1. Model Selection and Post Estimation
Venue: A (Reporting Room,10th floor, Library)
Tuesday, 15:10-18:30
Organizer and Chair: S. Ejaz Ahmed

15:10-15:40 S. Ejaz Ahmed (Brock U, St. Catharines, ON, Canada)
Model selection and post estimation: making sense or folly?
15:40-16:10 Michael J. Daniels (U of Texas at Austin, TX, USA)
Semiparametric approach to simultaneous covariance estimation for bivariate sparse longitudinal data

16:10-16:30 Tea Break

16:30-17:00 Xiaoli Gao (U of North Carolina, Greensboro, NC, USA)
Penalized adaptive weighted least square regression
17:00-17:30 Xuewen Lu (U of Calgary, AB, Canada)
Partially linear single-index proportional hazards model with current status data
17:30-18:00 Peter X. K. Song (U of Michigan, Ann Arbor, MI, USA)
Sparse multivariate factor analysis regression model
18:00-18:30 Yuan Wu (Duke U, Durham, NC, USA)
The analysis of spontaneous abortion with left truncation, partly interval censoring and cure rate

18:30-19:30 Dinner **(The 2nd floor of the 2nd Mess Hall)**

MS7. Design and Analysis of Experiments
Venue:B (Reporting Room 101, International College Building)
Tuesday, 15:10-17:00
Organizer: Augustyn Markiewicz, Chair: Lynn Roy LaMotte

15:10-15:40 Chengcheng Hao (Shanghai Jiao Tong U, China)
Infuence diagnostics diagnostics in linear system control with open-loop experimental data
15:40-16:10 Timothy E. O'Brien (Loyola U Chicago, IL, USA)
Efficient experimental design strategies in toxicology and bioassay

16:10-16:30 Tea Break

16:30-17:00 Min Wang (Michigan Technological U, Houghton, MI, USA)
Bayes factors for hypothesis testing in ANOVA designs

MS3. Magic Matrices
Venue:C (Reporting Room,3th floor,Maths Building)
Tuesday, 16:30-18:30
Organizers: Kai-Tai Fang & George P. H. Styan
Chair: Ka Lok Chu

16:30-17:00 Kai-Tai Fang(BNU-HKBU United International College,Zhuhai, China)
Classification of magic squares of order 4
17:00-17:30 Ziqi Lin (BNU-HKBU United International College, Zhuhai, China)
Some results on classification of magic squares of order 5
17:30-18:00 Ka Lok Chu (Dawson College,Westmount,QC,Cananda)
An illustrated philatelic introduction to doubly-classic 6x6 bordered magic matrics and to 4x4 Plato-like magic talismans
18:00-18:30 Ka Lok Chu (Dawson College, Westmount, QC, Canada)
Magic squares and postage stamps

18:30-19:30 Dinner **(The 2nd floor of the 2nd Mess Hall)**

Wednesday, 27 May 2015

Plenary Session 6
Venue: A
Wednesday, 08:30-09:10
Chair: Chris Gotwalt

08:30-09:10 Lynn Roy LaMotte (Louisiana State U, New Orleans, LA, USA)
Multivariate inverse prediction with mixed models

MS8. Linear and Mixed Models
Venue: A (Reporting Room,10th floor, Library)
Wednesday 09:10-12:30
Organizers: Simo Puntanen & Julia Volaufova
Chairs: Simo Puntanen 09:10-10:10; Julia Volaufova 10:30-12:30

09:10-09:40 Julia Volaufova (Louisiana State U, New Orleans, LA, USA)
More on criteria for variable selection in mixed effects linear models
09:40-10:10 Shuangzhe Liu (U of Canberra, Australia)
Sensitivity analysis in linear models

10:10-10:30 ***Tea Break***

10:30-11:00 Yongge Tian (Central U of Finance and Economics, Beijing, China)
A unified approach in BLUPs under linear mixed-effects model

11:00-11:30 Martin Singull (Linköping U, Sweden)
Testing sphericity and intraclass covariance structures under a growth curve model in high dimension

11:30-12:00 Kyle Snow(Ohio State U and Topcon Positioning Systems, Inc., Columbus, OH, USA)
On bias reduction for the total least-squares estimate of a conic section within an EIV-model

12:00-12:30 Eva Fiserova (Palacky U, Olomouc, Czech Republic)
Conics fitting by least squares

12:30-14:30 ***Lunch*** **(The 2nd floor of the 2nd Mess Hall)**

MS6. Matrices with Economic and Financial Applications (Session 1)
Venue:B (Reporting Room 101, International College Building)
Wednesday, 10:30-12:30
Organizer and Chair: Shuangzhe Liu

10:30-11:00 Kazuhiko Kakamu (Kobe U, Japan)
Direct and indirect effects on road productivity in Japan

11:00-11:30 Shiqing Ling(Hong Kong U of Science and Technology,Hong Kong,China)
Adaptive Lasso-based model selection of autoregressive models

11:30-12:00 Zhigang Yao (National U of Singapore)
Partial correlation screening for estimating large precision matrices, with applications to classification

12:00-12:30 Fukang Zhu (Jilin U, Changchun, China)
Influence diagnostics in log-linear integer-valued GARCH models

12:30-14:30 ***Lunch*** **(The 2nd floor of the 2nd Mess Hall)**

Contributory Session 1
Venue:C (Reporting Room,3th floor,Maths Building)
Wednesday, 09:10-10:10
Chair: Peter Semrl

09:10-09:30 Badredine Issaadi (University M'hamed Bougara of Boumerdes, Algeria)
Strong stability bounds for queues

09:30-09:50 Yulei Pang(Southern Connecticut State U, CT, New Haven, USA)
Linear switching systems as a model of the cards shuffle

09:50-10:10 Xiaoming Liu (U of Western Ontario, London, ON, Canada)
Markov aging, physiological age and phase-type law of mortality

Contributory Session 2
Venue:C (Reporting Room,3th floor,Maths Building)
Wednesday, 10:30-12:30
Chair: Zhi Geng

10:30-10:50 Ni Li (Hainan Normal U, Haikou, China)
The statistical analysis of recurrent event process with adjusting for confounding effects of dependent observation process
10:50-11:10 Guangbao Guo, (Shandong U, Jinan, China)
Parallel statistical computing for dynamic generalized linear models
11:10-11:30 Kangrui Wang (U of Leicester, UK)
Bayesian covariance modelling of big tensor-variate data sets &inverse non-parametric learning of the unknown model parameter vector
11:30-11:50 Jianhua Hu(Shanghai U of Finance and Economics, Shanghai, China)
On the James-Stein estimator for the multivariate linear regression model
11:50-12:10 Silvie Belaskova (Tomas Bata U in Zlin, Czech Republic)
Evaluation of asymptotic regression parameters tests for the proportional hazards model with delayed entries
12:10-12:30 Guanyu Hu (Florida State U, Tallahassee, FL, USA)
Comparison of facial recognition methods based on extension methods of Principal Component Analysis

12:30-14:30 Lunch **(The 2nd floor of the 2nd Mess Hall)**

Plenary Session 7
Venue: A (Reporting Room,10th floor, Library)
Wednesday, 14:30-15:10
Chair: Jeffrey J. Hunter

14:30-15:10 Mu-Fa Chen(Beijing Normal U, China)
Unified speed estimation of various stabilities

MS4. Matrices in Applied Probability
Venue: A (Reporting Room,10th floor, Library)
Wednesday, 15:10-18:00
Organizer and Chair: Jeffrey J. Hunter

15:10-15:40 Yongjiang Guo(Beijing U of Posts and Telecommunications, China)
Functional law of iterated logarithm for single server queue
15:40-16:10 Iddo Ben-Ari (U of Connecticut, Storrs, CT, USA)

Efficient coupling for a random-walk like process

16:10-16:30 ***Tea Break***

16:30-17:00 Quan-Lin Li (Yanshan U, Qinhuangdao, China)
Nonlinear Markov processes in big networks

17:00-17:30 Bernd F. Heidergott (Vrije U, Amsterdam, The Netherlands)
A critical account of perturbation analysis of Markov chains

17:30-18:00 Jeffrey J. Hunter (Auckland U of Technology, New Zealand)
The accurate computation of the key properties of Markov chains and Markov renewal processes

18:30-19:30 ***Dinner*** **(The 2nd floor of the 2nd Mess Hall)**

MS9. Matrices Useful for Modelling Multi-level Models
Venue:B (Reporting Room 101, International College Building)
Wednesday, 15:10-18:00
Organizer and Chair: Dietrich von Rosen

15:10-15:40 Tonu Kollo (U of Tartu, Estonia)
Testing structure of the dispersion matrix

15:40-16:10 Tapio Nummi (U of Tampere, Finland)
A semiparametric model for trajectory analysis with an application to height of Finnish children

16:10-16:30 ***Tea Break***

16:30-17:00 Anuradha Roy (U of Texas at San Antonio, TX, USA)
Score test for a separable covariance structure with the frst component as AR(1) correlation matrix and its performance comparison with the likelihood ratio test

17:00-17:30 Imbi Traat (U of Tartu, Estonia)
To balance or not to balance

17:30-18:00 Tatjana von Rosen (U of Stockholm, Sweden)
Block circular matrices in multivariate normal models

18:30-19:30 ***Dinner*** **(The 2nd floor of the 2nd Mess Hall)**

Contributory Paper Sessions

Contributory Session 3
Venue:C (Reporting Room,3th floor,Maths Building)
Wednesday, 15:10-16:10
Chair: Yoshio Takane

15:10-15:30 Volha Kushel, (Shanghai Jiao Tong U, China)

On matrix D-stability and related properties

15:30-15:50 Jibo Wu (Chongqing U of Arts and Science, China)
Comparison of unbiased estimators using Pitman's measure of closeness

Thursday, 28 May 2015

Plenary Session 8
Venue: A (Reporting Room,10th floor, Library)
Thursday, 08:30-09:10
Chair: Ravindra B. Bapat

08:30-09:10 Peter Semrl (U of Ljubljana, Slovenia)
Adjacency and coherency preservers

MS10.Teaching Matrices within Statistics
Venue: A (Reporting Room,10th floor, Library)
Thursday, 09:10-12:30
Organizer and Chair: Kimmo Vehkalahti

09:10-09:40 Kimmo Vehkalahti (U of Helsinki, Finland)
Teaching matrices within statistics

09:40-10:10 Reijo Sund (U of Helsinki, Finland)
Applications of matrix decompositions in Survo R

10:10-10:30 Tea Break

10:30-11:00 Maria Valaste (U of Helsinki, Finland)
Adjustment for covariate measurement errors in complex surveys

11:00-11:30 Jari Lipsanen (U of Helsinki, Finland)
Comparison and diagnostics of various latent variable models in social sciences

11:30-12:00 Markus Mattsson (U of Helsinki, Finland)
Network analysis of questionnaire data

12:00-12:30 Mika Mattila (Tampere U of Technology, Finland)
Studying the different properties of MIN and MAX matrices: a student-friendly approach

12:30-14:30 Lunch **(The 2nd floor of the 2nd Mess Hall)**

MS6. Matrices with Economic and Financial Applications (Session 2)
Venue:B (Reporting Room 101, International College Building)
Thursday, 09:10-10:10
Organizer and Chair: Shuangzhe Liu

09:10-09:40 Nobuaki Hoshino (Kanazawa U, Japan)
Applying the quasi-multinomial distribution
09:40-10:10 Ong Seng Huat (U of Malaya, Kuala Lumpur, Malaysia)
A family of mixed INAR(1) time series model with applications

10:10-10:30 Tea Break

MS11. G-Inverses, Linear Models and Multivariate Analysis
Venue:B (Reporting Room 101, International College Building)
Thursday, 10:30-12:30
Organizer and Chair: Hans Joachim Werner

10:30-11:00 Hans Joachim Werner (U of Bonn, Germany)
On an IPM-type method for determining predictions and estimated prediction error dispersions

11:00-11:30 Esra Akdeniz-Duran (Istanbul Medeniyet U, Turkey)
Generalized difference-based weighted mixed almost unbiased Liu estimator in partially linear models
11:30-12:00 Xiaomi Hu (Wichita State U, Wichita, KS, USA)
Generalized inverses and matrix space
12:00-12:30 Eric Im (U of Hawai'i at Hilo, HI, USA)
Leontief's input-output representation of least squares estimators of simple and multiple regression coefficients

12:30-14:30 Lunch **(The 2nd floor of the 2nd Mess Hall)**

CS5. Contributory Session: Stochastic Analysis and Related Areas
Venue:C (Reporting Room,3th floor,Maths Building)
Thursday, 09:10-12:30
Chair: Chuanzhong Chen

09:10-09:30 Li Ma (Hainan Normal University, Haikou, China)
Some New results on Fukushima's decomposition and stochastic calculus
09:30-09:50 Xinfang Han (Hainan Normal University, Haikou, China)
On h-transformation of positivity preserving semigourps and their associated Markov processes
09:50-10:10 Youjian Shen (Hainan Normal University, Haikou, China)
On the Monotonicity and Boundedness of the remainder of Stirling's formula

10:10-10:30 Tea Break

10:30-10:50 Xingqiang Xiu (Hainan Normal University, Haikou, China)
Groebner basis techniques for finiteness checking of Finitely presented groups

10:50-11:10 Jingshi Xu (Hainan Normal University, Haikou, China)
Decompositions of Herz-Morrey-Hardy spaces with variable exponents and their application

11:10-11:30 Shiyou Lin (Hainan Normal University, Haikou, China)
Gevrey regularity for the non-cutoff nonlinear homogeneous Boltzmann equation with strong singularity

11:30-11:50 Saisai Yang (Hainan Normal University, Haikou, China)
Girsanov Transformations for Non-Symmetric Markov Processes

11:50-12:10 Weiyan Yu (Hainan Normal University, Haikou, China)
Nonlinear maps preserving Lie products on triangular algebras

12:10-12:30 Xiaofen Huang (Hainan Normal University, Haikou, China)
The Fully Entangled Fraction of Quantum States

12:30-14:30 Lunch **(The 2nd floor of the 2nd Mess Hall)**

Abstracts of Talks

Moore-Penrose Inverse of a Euclidean Distance Matrix

Ravindra B. Bapat

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Abstract: A symmetric and nonnegative matrix with zero diagonal elements is called a predistance matrix. An $n\times n$ predistance matrix $D=(d_{ij})$ is said to be an $n\times n$ Euclidean distance matrix (EDM), if there exist n points $p_1,\cdots,p_n$ in a Euclideanspace R^r satisfying $d_{ij}=\left\|p_i-p_j\right\|^2$ $(i,j=1,2,\cdots,n)$ .If the points $p_1,\cdots,p_n$ are on a hypersphere in R^r ,then D is said to be spherical. An EDM that is not spherical is called nonspherical. A necessary and sufficient condition for a predistance matrix D to be an EDM is that $B=-\frac{1}{2}PDP$ is positive semidefinite, where $P=I_n-\frac{1}{n}J$, J being the matrix of all ones. We discuss various expressions for the inverse (when it exists) and the Moore-Penrose inverse of a Euclidean distance matrix (EDM) that are determined only by the positive semidefinite matrix B associated with the EDM. Both spherical and nonspherical EDMs are considered. A formula for the inverse of a principal submatrix of an EDM is also derived, whose expression uses the Schur complement of the Laplacian of the EDM. As an application, we obtain an expression for the terminal Wiener index of a tree. The talk is based on joint work with Balaji (Linear Algebra and Its Applications,2007) and Kurata (Linear Algebra and Its Applications,2014).

Joint Likelihood Estimation for Joint Modeling Survival and Multiple Longitudinal Processes

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Abstract: Motivated from an empirical analysis of data collected by a smoking cession study,we propose a joint model (JM) of survival data and multiple longitudinal covariate pro-cesses, develop an estimation procedure for this model using likelihood-based approach,and further establish the consistency and asymptotic normality of the resulting estimate. Computation for the proposed likelihood-based approach in the joint modeling is particularly challenging since the estimation procedure involves numerical integration over multi-dimensional space for the random effects in the JM. Existing numerical inte-gration methods become ineffective or infeasible for the JM. We introduce a numerical integration method based on computer experimental designs for the JM. We conduct Monte Carlo simulation to examine the finite sample performance of the procedure and compare the new numerical integration method with existing ones. We further illustrate the proposed procedure via an empirical study of smoking cession data.

Abbreviated Title: JM survival and multiple longitudinal processes

Key Words and phrases: Cox's model, mixed effect models, partial likelihood.

Regularization of Covariance Structures

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Abstract: The need to estimate structured covariance matrices arises in a variety of applications and the problem is widely studied in statistics. A new method is proposed for regularizing the covariance structure of a given covariance matrix whose underlying structure has been blurred by random noise, particularly when the dimension of the covariance matrix is high. The regularization is made by choosing an optimal structure from an available class of covariance structures in terms of minimizing the discrepancy, defined via the entropy loss function and Frobenius norm, between the given matrix and the class. A range of potential candidate structures comprising tridiagonal Toeplitz, compound symmetry, AR(1), and banded Toeplitz are considered. It is shown that for the first three structures local or global minimizers of the discrepancy can be computed by one-dimensional optimization, while for the fourth structure Newton's method enables efficient computation of the global minimizer. Simulation studies are conducted, showing that the proposed new

approach provides a reliable way to regularize covariance structures for both low- and high-dimensional problems. The approach is also applied to real data analysis, demonstrating the usefulness of the proposed approach in practice.

Mixtures of common factor analyzers for high-dimensionaldata with missing values

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Abstract: Mixtures of common factor analyzers (MCFA), thought of as a parsimonious extension of mixture factor analyzers (MFA), have recently been developed as a novel approach to analyzing high-dimensional data, where the number of observations is not very large relative to their dimension. The key idea behind MCFA is to reduce further the number of parameters in the specification of the component-covariance matrices. The occurrence of missing data persists in many scientific investigations and often complicates data analysis. In this work, I present a computationally flexible expectation conditional maximization (ECM) algorithm for maximum likelihood estimation of the MCFA model with partially observed data. To facilitate the implementation, two auxiliary permutation matrices are incorporated into the estimating procedure for exactly extracting the location of observed and missing components of each observation. Practical techniques for the model-based clustering and discriminant analysis are also provided. The proposed methodology is illustrated with the analysis of ozone data and an experimental study on image reconstruction.

Robust adaptive multivariate LAD-lasso

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Abstract: The lasso (Tibshirani, 1996) is a popular shrinkage and selection method for linear regression. It minimizes the residual sum of squares subject to the sum of

the absolute values of regression coefficients being less than a constant. The ordinary least squares estimates, and consequently the lasso estimates, are very sensitive to outliers; furthermore, since lasso uses the same tuning parameter for all the regression coefficients, the estimates can be somewhat biased. We consider the multivariate multiple regression case and propose an adaptive multivariate LAD-lasso method which is quite robust against outliers in the response variable and has smaller bias than lasso or LAD-lasso.

A skew--normal mixture of joint location, scale and skewness models

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Abstract: Normal mixture regression models are one of the most important statistical data analysis tools in a heterogeneous population. When the data set under consideration involves asymmetric outcomes, in the last two decades, the skew normal distribution has been shown beneficial in dealing with asymmetric data in various theoretic and applied problems. In this paper, we propose and study a new novel class of models: a skew--normal mixture of joint location, scale and skewness models to analyze the heteroscedastic skew--normal data come from a heterogeneous population. The issues of maximum likelihood estimation are addressed. In particular, an Expectation--Maximisation(EM) algorithm for estimating the model parameters is developed. Properties of the estimators of the regression coefficients are evaluated through Monte Carlo experiments. Results from the analysis of a real data sets from the Body Mass Index(BMI) data are presented.

Keywords: Mixture regression models; Mixture of joint location, scale and skewness models;EM algorithm; Maximum likelihood estimation; Skew-normal mixtures.

AMS 2000 Subject Classication: 62F10; 62H12.

Efficient Model Selection for Mixtures of Probabilistic

PCA via Hierarchical BIC

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Abstract: This paper concerns model selection for mixtures of probabilistic principal component analyzers (MPCA). The well known Bayesian information criterion (BIC) is frequently used for this purpose. However, it is found that BIC penalizes each analyzer implausibly using the whole sample size. In this paper, we present a new criterion for MPCA called hierarchical BIC in which each analyzer is penalized using its own effective sample size only. Theoretically, hierarchical BIC is a large sample approximation of variational Bayesian (VB) lower bound and BIC is a further approximation of hierarchical BIC. To learn hierarchical-BIC
-based MPCA, we propose two efficient algorithms: two-stage and one-stage variants. The two-stage algorithm integrates model selection with respect to the subspace dimensions into parameter estimation and the one-stage variant further integrates the selection of the number of mixture components into a single algorithm. Experiments on a number of synthetic and real-world data sets show that (i) hierarchical BIC is more accurate than BIC and several related competitors; (ii) the two proposed algorithms are not only effective but also much more efficient than the classical two-stage procedure commonly used for BIC.

Modeling Nonstationary Processes on Sphere using Kernel Convolution

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Abstract: The wide use of satellite-based instruments provides measure-
ments in climatology on a global scale, which often have nonstationary covariance structure. In this paper we address the issue of modeling axially symmetric spatial random fields on sphere with a kernel convolution approach. The observed random field is generated by convolving a latent uncorrelated random field with a class of Matern type kernel functions. By allowing the parameters in the kernel functions to vary with locations, we are able to generate a flexible class of covariance functions

and capture the nonstationary properties. Since the corre-
sponding covariance functions generally do not have a closed form, numerical evaluations are necessary and a pre-computation table is used to speed up the computation. For regular grid data on sphere, the circulant block property of the covariance matrix enables us to use Fast Fourier Transform (FFT) to get its determinant and inverse matrix efficiently. We apply this approach to the Total Ozone Mapping Spectrometer (TOMS) ozone data and compare it with other existing models.

Mixture of skew-normal factor analysis models

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Abstract: The mixture of factor analyzers (MFA) model provides a powerful tool for analyzing high-dimensional data as it can reduce the number of free parameters through its factor-analytic representation of the component covariance matrices. This paper extends the MFA model to incorporate a restricted version of the multivariate skew normal distribution for the latent component factors, called mixtures of skew-normal factor analyzers (MSNFA). The proposed MSNFA model allows us to relax the need of the normality assumption for the latent factors in order to accommodate skewness in the observed data. The MSNFA model thus provides an approach to model-based density estimation and clustering of high-dimensional data exhibiting asymmetric characteristics. A computationally feasible Expectation Conditional Maximization (ECM) algorithm is developed for computing the maximum likelihood estimates of the model parameters. The potential of the proposed methodology is exemplified using both real and simulated data.

Principle points and its application in simulation for univariate asymmetric distribution

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Abstract: A set of K principle points of a distribution are defined as a set of k points that retain as much information as possible of the distribution in terms of mean squared distance. It provides an optimal discrete approximation to continuous distribution. This paper reviews two methods of selection of principal points and discusses their performance in asymmetric univariate continuous distributions. We propose to apply principle points in Monte Carlo simulation from two aspects: 1. Resample repeatedly from the approximate discrete distribution constituted by principle points and estimators are obtained based on the resampling points. 2. Sample points are taken by using principle points to variance reduction technique in Monte carlo. By this sampling method, the variance of unbiased estimator is proven to dramatically reduce. We use Gamma distribution and a mixture of normal distribution to demonstrate the selection of principle points and evaluate the performance of estimation when using principle points in Monte Carlo simulation. Results show that our methods can significantly improve the results obtained by the use of simple Monte Carlo simulation. This is a joint work with Min Zhou. This work is partially supported by UIC research grant No. R201409.

An Extraordinary Property of The Arcsine Distribution

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Abstract: For a given continuous random variable X with cdf F(x), it is requested, in resampling technique, to construct a discrete random variable Y with probability distribution P(Y= yj)=pj, j=1,…,n. Denote the cdf of Y by G(y). Obviously, we wish difference |F(x) -G(x)| to as small as possible for each x. Especially, we wish X and Y have the same lower order moments. In this talk we focus on the arcsine distribution and propose to use the number-theoretic method for constructing Y such that Y and X have the same moments of all orders, if the number of points n is larger than the order of moment. It is a surprising property of the arcsine distribution. We also apply this Y has a perfect performance in resampling.

KEY WORDS: Arcsine distribution, Representative points, Resampling

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Representative Points of Univariate Distribution

in Statistical Simulation

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Abstract: Representative Points (RP) have been considered by many people. It is a set of points that can retain majority of information about the population. Traditional Monte Carlo, Bootstrap and Resampling are the basic methods in statistical simulation based on a random sample. Fang et al. (2013) pointed out firstly that we can use RP to replace i.i.d. random samples, to construct an approximate distribution and then resample from the approximation for Statistical inference. In this talk, we consider the univariate distribution (the student's distribution), and indicate that using this new method to do the statistical simulation, such as point estimation of parameters (mean, variance, skewness and kurtosis), estimation of density function and quantiles, can significantly improve the accuracy of the estimator of the statistics, and accelerate the converging speed of the statistics. This is a joint work with Kai-Tai Fang and Wen-Jun Wang. This work is partially supported by UIC research grant No.R201409.

Randomized Likelihood Sampling

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Abstract: A new algorithm is motivated by the similarities and differences between the Metropolis-Hastings (MH) algorithm and sampling importance/
resampling (SIR). Both algorithms sample from a pool of candidates that is very small for MH but is huge for SIR. The MH candidates are local and change in every iteration, while the pool of SIR is global but fixed, that is, never updated. We propose using a pool of candidates that is not huge but large enough—with the aid of a quasi-random sequence—to search the entire support, and refreshing the pool constantly. The new sampler begins with a quasi-random sequence as the candidates' pool, then iterates among the following three steps: (i) computes the likelihood of all the candidates; (ii) selects a sample from the candidates according to the likelihood; and (iii) creates a new pool of candidates by independently randomizing the current pool. Thus, it generates independent samples like SIR but without the difficulties of designing a problem-specific proposal distribution and of producing a huge pool. We

call the sampler randomized likelihood sampling (RLS) because it randomizes the likelihood and samples according to the likelihood of the target distribution, not the importance. RLS uses the uniformity of a quasi-random sequence to search and randomization to achieve independence. Because the likelihood is computed from a kernel of the target distribution, it has wide applicability. RLS can sample multimodal kernels without getting stuck in localities. A bootstrap procedure is proposed to compute the Monte Carlo error. Some numerical comparisons are reported.

Antieigenvalue Analysis, New Applications:

Continuum Mechanics, Economics, Number Theory

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Abstract: My recent book Antieigenvalue Analysis , World-Scientific, 2012, presented the theory of antieigenvalues from its inception in 1966 up to 2010, and its applications within those forty-five years to Numerical Analysis, Wavelets, Statistics, Quantum Mechanics, Finance, and Optimization. Here I am able to offer three further areas of application: Continuum Mechanics, Economics, and Number Theory.

Professor Yanai and multivariate analysis

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Abstract: Late Professor Yanai has contributed to many fields ranging from aptitude diagnostics, epidemiology, and nursing to psychometrics and statistics. This paper reviews some of his accomplishments in linear algebra and multivariate analysis through his collaborative work with the present author, along with some untold episodes for the inception of key ideas underlying the work. The various topics covered include constrained principal component analysis, extensions of Khatri's lemma, the Wedderburn-Guttman theorem, ridge operators, decompositions of the total association between two sets of variables, and ideal instruments. A common

thread running through all of them is projectors and singular value decomposition (SVD), which are the main subject matters of a recent monograph by Yanai, Takeuchi, and Takane (2011).

Where have all those 70 years gone?

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Abstract: This is what I try to figure out in this talk.

Positive semidefiniteness of estimated covariance matrices in linear models for sample survey data

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Abstract: Descriptive analysis of sample survey data estimates means, totals and their variances in a design framework (see for example Haslett, 1985). When analysis is extended to linear models, the standard design-based method for regression parameters includes inverse selection probabilities as weights, ignoring the joint selection probabilities. When these joint selection probabilities are included to improve estimation, and the error covariance is not a diagonal matrix, a proof will be given that the unbiased sample based estimator of the covariance is the Hadamard product of the population covariance, the elementwise inverse of selection probabilities and joint selection probabilities, and a sample selection matrix of rank equal to the sample size. This Hadamard product is however not always positive definite, which has implications for best linear unbiased estimation. Rao (1968) provides conditions under which a change in covariance structure leaves BLUEs unchanged. The results have been extended by Haslett and Puntanen (2010) to BLUPs, and to BLUEs and BLUPs. Interestingly, this class of "equivalent" matrices for linear models includes matrices that are not positive semi-definite. The paper will use these results on BLUEs and BLUPs to explore how the estimated covariance from the

sample can be modified so that it meets necessary conditions to be positive semidefinite, while retaining the property that fitting a linear model to the sampled data yields the same BLUEs or BLUPs as when the original Hadamard product is used.

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From Helsinki to Haikou via Istanbul and Nokia

(for Simo Puntanen 70 session)

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Abstract: I will reflect on selected experiences with Simo Puntanen concentrating especially on the scientific adventures we have shared around the globe during the last ten years.

An indexed illustrated bibliography for Simo Puntanen

in celebration of his 70th birthday

George P. H. Styan[a] & Ka Lok Chu[b]

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Abstract: Many happy returns, Simo! To celebrate over 25 years of collaboration, we present an indexed and illustrated bibliography on the occasion of your 70th birthday on 20 July 2015. This bibliography, which is also annotated and hyperlinked, identifies over 60 publications with both Simo Puntanen and George P. H. Styan as co-authors, our so-called "PunStys". Some selected preprints are included. The results in these publications, issued from 1988 to-date, have benefited from PunSty collaborators, in particular, Jerzy K. Baksalary (1944–2005), Ka Lok Chu, and Jarkko Isotalo, as well as Oskar Maria Baksalary, Francisco Carvalho, S. W. Drury, Shane T. Jensen, Lucinda Li, Erkki P. Liski, Shuangzhe Liu, Agnes W. L. Loie, Chang-Yu Lu, Augustyn Markiewicz, Sujit Kumar Mitra (1932–2004), Jarmo Niemelä, Markku Nurhonen, George A. F. Seber, Gerald E. Subak-Sharpe (1925–2011), Hans Joachim Werner, Haruo Yanai (1940–2013), and Fuzhen Zhang. Many thanks!

Keyword 1: bibliography
Keyword 2: Simo Puntanen

Causal Effects and Causal Networks

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Abstract: We discuss causal effect evaluation and causal network learning. First for the causal effect evaluation, we want to evaluate the causal effects of the cause variables on the effect variables. Yule-Simpson paradox means that the association between two variables may be reversed by omitting a third variable, called a confounder. The identifiability of causal effects is discussed when some confounder is unobserved or missing not at random [2]. In medical studies and clinical trials, surrogates and biomarkers are often used to reduce costs or duration when measurement of a true endpoint may be expensive, inconvenient or infeasible in a practical length of time. We present the surrogate paradox
that a treatment has a positive effect on the surrogate, and the surrogate has a positive effect on the endpoint, but the treatment may have a negative effect on the endpoint [1]. Many existing criteria of surrogates cannot avoid the surrogate paradox. We propose novel criteria to avoid the surrogate paradox [4, 6].
Next for the causal network learning, we want to discover the relationships among variables from data. We propose several approaches for learning causal networks from data. The first approach is the decomposition learning. We recursively decompose a large network learning problem into many problems of small network learning, and

then we combines these small learned networks into a large whole causal network [7]. The second one is the active learning approach. Only using observational
data, we can obtain only a Markov equivalence class of potential causal networks, and thus we may not determine all causal relationships completely. Using the active learning approach, we try to manipulate
some variables as few as possible such that we can determine the unique causal network in the class [3].The third one is to learn a local causal network around a given target variable. Given a target variable
and observational data, we sequentially find the neighbors of the target variable and the neighbors of the neighbors until we can determine the direct causes and the direct effects of the target variable [5].

Keywords: Causal Effects; Causal Networks; Surrogate Paradox; Yule-Simpson Paradox

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Model Selection and Post Estimation:

Making Sense or Folly?

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Abstract: I will consider estimation and prediction problems in generalized linear models when there are a number of predictors and some of them may have no and/or weak impact in predicting the response variable. In the context of two competing models where one model includes all predictors and the other restricts variable coefficients to a candidate linear subspace based on subject matter or prior knowledge, we investigate the relative performances of Stein type shrinkage, pretest, and penalty estimators with respect to the full model estimator. The asymptotic properties of the non-penalty estimators are documented. A Monte Carlo simulation study show that the mean squared error (MSE) of an adaptive shrinkage estimator is comparable to the risk of the penalty estimators in many situations and in particular performs better than the penalty estimators when the dimension of the restricted parameter space is large model. A real data set analysis is also offered to compare the relative performance of suggested strategies.

Key words: Generalized Linear Models, Candidate Subspaces, Variables Selection, Penalty and Shrinkage Estimation, Asymptotic and Simulation Analysis

Joint work with: S. Hossain and K. Doksum

A Semiparametric Approach to Simultaneous Covariance Estimation for Bivariate Sparse Longitudinal Data

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Abstract: Estimation of the covariance structure for irregular sparse longitudinal data has been studied by many authors in recent years but typically using fully parametric specifications. In addition, when data are collected from several groups over time, it is known that assuming the same or completely different covariance matrices over groups can lead to loss of efficiency and/or bias. Nonparametric approaches have been proposed for estimating the covariance matrix for regular univariate longitudinal data by sharing information across the groups under study. For the irregular case, with longitudinal measurements that are bivariate or multivariate, modeling becomes more difficult. In this talk, to model bivariate sparse longitudinal data from several groups, we propose a flexible covariance structure via a novel matrix stick-breaking processes. This approach avoids explicit model selection (both in terms of how the structure

varies between and within groups) and appropriately adjusts for the uncertainty of the model selection process.

Penalized adaptive weighted least square regression

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Abstract: In high-dimensional settings, penalized least squares approach can lose its efficiency in both estimation and variable selection due to the existence of heteroskedasticity. In this manuscript, we propose a novel approach, penalized adaptive weighted least squares (PAWLS), for simultaneous robust estimation and variable selection. The proposed PAWLS is justified from both Bayesian understanding and robust variable selection points of view. We also establish oracle inequalities for both regression coefficients and heterogeneous parameters. The performance of the proposed estimator is evaluated in both simulation studies and real examples.

Partially Linear Single-index Proportional Hazards Model with Current Status Data

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Abstract: We introduce a partially linear single-index proportional hazards model with current status data. We consider efficient estimations and effective algorithms in the model. We use polynomial splines to estimate both the cumulative baseline hazard function and the nonparametric link function with monotonicity constraint and with no such constraint, respectively. We propose a simultaneous sieve maximum likelihood estimation for regression parameters and nuisance parameters which are approximated by polynomial splines, and show that the resultant estimator of regression parameter vector is asymptotically normal and achieves the semiparametric information bound if the nonparametric link function is truly a spline. We conduct

simulation studies to examine the finite sample performance of the proposed estimation method, and present an analysis of renal function recovery data for illustration.

Sparse multivariate factor analysis regression model

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Abstract: The multivariate regression model is a useful tool to explore complex associations between multiple response variables (e.g. gene expressions) and multiple predictors (e.g. SNPs). When the multiple responses are correlated, ignoring such dependency will impair statistical power in the data analysis. Motivated by an integrative genomic data, we propose a new methodology – sparse multivariate factor analysis regression model (smFARM), in which the covariance of the response variables is modeled by a factor analysis model with latent factors. This proposed method not only allows us to address the challenge that the number of genetic predictors is larger than the sample size, but also to adjust for unobserved genetic and/or non-genetic factors that potentially conceal the underlying real response-predictor associations. The proposed smFARM is implemented efficiently by utilizing the strength of the EM algorithm and the group-wise coordinate descend algorithm. In addition, the identified latent factors are explained by the means of gene enrichment analysis. The proposed methodology is evaluated and compared to the existing methods through extensive simulation studies. We apply smFARM in an integrative genomics analysis of a breast cancer dataset on the relationship between DNA copy numbers and gene expression arrays to derive genetic regulatory patterns relevant to breast cancer.

The Analysis of Spontaneous Abortion with Left Truncation, Partly Interval Censoring and Cure Rate

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Abstract: Infections during pregnancy will increase women's risk of serious consequences. People have started to study the cohorts with safety data for vaccination during pregnancy. However, new advanced statistical methods are much needed to address the complicated data features of such cohorts including cure rate, partly interval censoring and left truncation. We propose to use semi-parametric sieve estimation method to deal with this complicated data structure and we assume the data follows non-mixture cure model with Cox proportion hazard regression. Simulation and real data studies are performed. We also provided asymptotic results for the proposed estimation method.

Influence diagnostics in linear system control with open-loop experimental data

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Abstract: Model predictive control is a widely used industrial technique to deal with trajectory tracking problems in many process industry applications, as well as in temporal logic and financial portfolio optimization. The technique relies on dynamic models of the system with manipulated vari-ables, for instance, dynamic linear models estimated out of past experimental data. This work proposes a control-oriented diagnostics method to detect influential observations in discrete-time dynamic linear models with open-loop experimental data. Not only on system parameter estimation, influence of individual observations on controller design are also measured. Through perturbing the data in their neighborhood, the sensitivity of model predictive control policies with respect to observations are studied.

Keywords: Influential observations; Statistical diagnostics; case-weighted perturbation; model pre-dictive control; stochastic system

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Efficient Experimental Design Strategies In Toxicology and Bioassay

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Abstract: Analysis of multicategory response data in which the multinomial dependent variable is linked to selected covariates includes several rival models. These models include the adjacent category (AC), baseline category logit (BCL), two variants of the continuation ratio (CR), and the proportional odds (PO). For a given set of data, the fits and predictions associated with these various models can vary quite dramatically as can the associated optimal designs (which are then used to estimate the respective model parameters). Using real datasets, this talk first illustrates fits of these models to various datasets and highlights the associated optimal designs, pointing out the inadequacy of these experimental designs to detect lack-of-fit. We next introduce and illustrate a new generalized logit (GL) model which generalizes all of the above five models, and demonstrate how this GL model can be used to find "robust" optimal designs. These latter designs are thus useful for both parameter estimation and checking for goodness-of-fit. Extensions are also provided for synergy models used in bioassay. Key illustrations are provided as are appropriate software tools.

Bayes factors for hypothesis testing in ANOVA designs

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Abstract: In this talk, we consider various Bayes factor approaches for the hypothesis testing problem in analysis-of-variance (ANOVA) designs. We firstly reparameterize the ANOVA model with constraints for uniqueness into a classical linear regression model without constraints. We then adopt Zellner's g-prior for the regression coefficients and place a hyper-g prior for g, providing a mixture of g-priors. We propose an explicit closed-form expression for Bayes factor without integral representation. Specifically, we investigate the consistency of Bayes factors based on mixture g-priors when the model dimension grows with the sample size. The proposed results generalize some existing ones for the one-way/two-way ANOVA models and can directly be applied to higher-order factorial models. Applications to two real-data sets are presented to compare the performances between the proposed and previous Bayesian procedures in the literature.

Classification of Magic Squares of Order 4

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Abstract: With a history of more than 3000 years, magic squares still are mysterious in various aspects. We in this paper give a comprehensive review and study on classification of magic squares of order 4.
There are a lot of studies on this topic. Several classification methods were proposed such as Anderson graph, Dudeney types, Frenicle - Amela pattern, transformation group, and so on. In this paper we propose two new angels for classification of magic squares of order 4. One is based on eigenvalues of the magic squares and another is to employ the theory of the majorization. The latter consideration is new. Relationships among results by the different classification methods are given.

Some Results on Classification of Magic Squares of Order 5

Ziqi Lin and Sijie Liu

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Abstract: There are 2,202,441,792 magic squares of order 5 indicated by Schroeppel's Method in 1975. His assistant Michael Beder published the program without computational code. Therefore, it is not easy to find all of magic squares of order 5 form inernet. In this talk we briefly introduce our compute code for generating all of the magic squares of order 5. Then we introduce some new results on their classification. We appreciate Prof. George Styan and Prof. Kai-Tai Fang for their guidence and help. This work is partially supported by UIC research grant No. R201409.

An illustrated philatelic introduction to doubly-classic 6x6 bordered magic matrices and to 4

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Abstract: Our motivation in this talk is the 13th-century Anxi iron-plate doubly-classic 6x□6 bordered magic square discussed by Kai-Tai Fang at the 22nd International Workshop on Matrices and Statistics in Toronto (IWMS-2013), and which we define by the matrix A. We also study the magic square in the "16th-century magical square in a manuscript" given on the "Bedouin Silver: magical squares" website, and which we define by the matrix B. In his "Bordered magic squares" website, Harry White observed that for such magic squares, in all there are 140 "border groups". Of these 140 we found 93 displayed in the literature. We identify all 140 and find that they occur in 70 pairs, with the matrices A and B forming one such pair. Moreover, we find that the rank depends only on the rank of the inner 4x4 heart submatrix H, which is Plato-like in that H = P + hE, where P is the well-known Plato magic matrix and E has every entry equal to 1; here h = 10. We end our talk by displaying some seals and talismans with Plato-like magic squares.

Keyword 1: magic matrices
Keyword 2: Anxi iron-plate doubly-classic 6 □6 bordered magic square

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Magic Squares and Postage Stamps

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Abstract: We present a philatelic introduction to magic squares, beginning with the well-known 4×4 Dürer magic square in Melencolia I (1514) depicted in sheetlets from Aitutaki/Cook Islands (1986), Mongolia (1978),Djibouti (2007), and the Comores (1978). We also found a Franklin bent-diagonal magic square on a postage stamp

from the USA (2006),which also shows a whirlwind and water spouts, from Benjamin Franklin's Experiments and Observations on Electricity (1769). On 9 October 2014, Macau Post issued a set of several philatelic items for magic squares. Two stamps feature magic-square palindromes: the 5 × 5 Sator–Arepo (c. 100 AD) and a 15 × 15 detail from the 29 × 29 Su Hui palindrome (c. 357 AD). The set also includes a souvenir sheet featuring the 3 × 3 Luoshu and a first-day cover with a 9 × 9 Hendricks diamond-inlaid magic square.

Keywords: Dürer, Melencolia I, Macau, magic squares, philatelic items, Luoshu

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Multivariate Inverse Prediction with Mixed Models

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Abstract: Insects visit a dead body left outdoors. Their characteristics (measurements of size and development and combinations of species) can provide a biological clock useful in estimating the time since death. Given the multivariate measurement y* from a mystery specimen sampled at the scene, the objective is to devise reasonable and defensible statistical methodology to support an estimate of the age of the specimen. For that purpose, training data are available from rearing experiments for the species in question. They comprise independent observations on y at ages spanning the development cycle, under controlled (principally temperature) conditions. Central features of such data are that the y- age relation is not linear and the variance-covariance matrix evolves steeply with age.

Inverse prediction, also known as calibration, has a reputation of being computationally difficult, particularly with a multivariate response.Methods for heteroscedastic multivariate responses are practically unknown.In the forensic sciences literature, most developments have modeled age as a function of y, in reverse cause-effect order, with multiple regression, and ignored the inconstant variance.

These relations can be modeled within the context of mixed models, with separate models for the mean vector and the variance-covariance matrix in terms of age and temperature. At each potential age, comparison of Y* to the model fit to the training data gives a p-value for the test of y* as a multivariate outlier at that age.

The methodology and computations of mixed models are well-developed and widely

available in standard statistical computing packages. In this talk, I shall illustrate the formulation and implementation of multivariate inverse prediction in terms of mixed models.

Research reported in this talk was supported by Award 2013-DN-BXK042,
U. S. Department of Justice, National Institute of Justice.

More on criteria for variable selection in fixed effects linear models

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Abstract: The R^2 statistic in fixed-effects regression settings is routinely interpreted as a measure of proportion of variability explained by the model. Because R^2 for a given set of responses is a monotone increasing function in the number of explanatory variables, it is used as a basis for selection algorithms, such as the "all-submodels"method. Here we investigate the R^2 , adjusted R^2 , as well as other criteria, such as AIC, BIC, and SBIC, from a slightly different point of view. Assuming that there is an underlying true model, we try to address the question, how well or how likely a given criterion identifies the true model. A simulation study designed for different levels of fixed noncentrality parameter was conducted in order to address this question.

This is joint work with ONDREJ BLAHA and LYNN R. LAMOTTE
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Sensitivity analysis in linear models

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Abstract: In this work we consider the general linear model and some of its

extensions. We study their sensitivity matrix results, with theore-tical developments and numerical comparisons. We include illustrated examples.

Joint work with Tiefeng Ma and Yonghui Liu

A unified approch in BLUPs under linear mixed-effects model

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Abstract：Assume that a general linear mixed-effects model $y = X\beta + Z\gamma + \varepsilon$ is given. In this talk, I'll introduce how to derive analytical expressions of the best linear unbiased predictor (BLUP) of a general vector $F\beta + G\gamma + H\varepsilon$of all unknown parameters in the model by solving a constrained quadratic matrix-valued function optimization problems in the Lowner sense. In addition, many formulas and decomposition equalities associated with the BLUPs and their covariance matrices will be presented. The work in this talk is an ongoing approach on unified theory of BLUPs under fixed-effects, random-effects, and mixed-effects models. A starting work on this topic was presented by the present speaker in: A new derivation of BLUPs under random-effect model. Metrika. DOI: *10.1007/s00184-015-0533-0.*

Testing Sphericity and Intraclass Covariance Structures under a Growth Curve Model in High Dimension

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Abstract: In this talk we consider the problem of testing (a) sphericity and (b) intraclass covariance structure under a Growth Curve model. The maximum likelihood estimator (MLE) for the mean in a Growth Curve model is a weighted

estimator with the inverse of the sample covariance matrix which is unstable for large p close to N and singular for p larger than N. The MLE for the covariance matrix is based on the MLE for the mean, which can be very poor for p close to N. For both structures (a) and (b), we modify the MLE for the mean to an unweighted estimator and based on this estimator we propose a new estimator for the covariance matrix. This new estimator leads to new tests for (a) and (b). We also propose two other tests for each structure, which are just based on the sample covariance matrix.

On Bias Reduction for the Total Least-Squares Estimate of a Conic Section within an EIV-Model

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Abstract: For a straight line in 2D, it is well known that the Total Least-Squares (TLS) estimator within an Errors-In-Variables (EIV) model generates the same solution as orthogonal regression, which turns out to be (locally) unbiased; see, e.g., Schaffrin and Wieser (2008) who treated the 2D line there. Unfortunately, however, the adjustment of a conic section (such as a parabola in 2D) will, if based on orthogonal regression, be biased within the standard EIV model. Here, an approach will be investigated where TLS estimation is applied to a modified EIV model in order to account for the bias that must otherwise be expected. The effect of such ``bias reduction'' will be illuminated in a realistic example from geodesy, taken out of a textbook by Mikhail and Gracie (1981).

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Schaffrin, B. and Wieser, A. (2008). On weighted total least-squares adjustment for linear regression. *Journal of Geodesy*, 82(7):415-421.

Conics Fitting by Least Squares

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Abstract: Fitting quadratic curves (circle, ellipse, hyperbola and parabola) to given data points in the plane is a fundamental task in many fields like engineering, astronomy, physics, biology, quality control, image processing, etc. Behind the well-known techniques for conics fitting in the statistical literature belong the moment method, maximum likelihood method, and the least squares method.

The classical approach for fitting conics by the least squares method is geometric fit based on minimization of geometric distances from observed data points to the fitting curve (Chernov, 2010). In the contribution, we focus on solving the problem of best geometric fit by the linear regression model with nonlinear constraints. The constraints are represented by the general equation of the certain conics. In order to obtain approximate linear regression model, this nonlinear constraints are being linearized by the by the first-order Taylor expansion. According to the iterative estimation procedure being proposed in (K\"{o}ning et. al, 2014) will be gained locally best linear unbiased estimates of the unknown algebraic parameters and also estimates of their uncertainties. These resulting estimates as stated in (Donevska et al., 2011) converge to the orthogonal least squares estimates, further to the maximum likelihood estimates if normality is assumed. Subsequently, we are capable to express the estimates of the geometric parameters of the considered conic like the centre, angle of rotation, and lengths of the semi-axes and their uncertainties.

The aim of the contribution is to show the iterative algorithms for ellipse, circle, hyperbola and parabola fitting. Furthermore, the results of performed simulation study of the algebraic and geometric conics parameters estimators accuracy will be presented.

Keywords: Conics fitting, least squares, orthogonal regression, accuracy.

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Direct and Indirect Effects on Road Productivity in Japan

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Abstract: The spatial econometrics enable us to decompose the marginal effect of the concerning variables into direct and indirect effects. LeSage and Pace (2009) proposed the summary measures for them and showed that the Bayesian approach makes us implement the statistical inference for the measures. This study examines the productivity of roads in Japan from a viewpoint of the spatial econometrics using this technique and argues the direct and indirect effects from a Bayesian point of view. From the empirical results, we can find that the marginal effect is underestimated if the indirect effect is ignored.

Adaptive Lasso-based Model Selection of Autoregressive Models

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Abstract: This paper studies an adaptive lasso-based approach for model selection of a finite order autoregressive [AR(p)] models. We fit an AR(p_{n}) model to the data, where $p_{n}\to\infty$ when the sample size $n\to\infty$. The adaptive lasso approach estimates parameters and the order p, simultaneously, and achieve the ``oracle'' properties$--$ zero parameters are estimated to be zero exactly and other estimators are as efficient as those under the true model. Our approach highly relies on the LSE of AR(p_{n}) model, which is shown that any linear combination of the LSE is asymptotically normal even though the dimension of the unknown parameters is going to infinity. An algorithm is discussed. In particular, we propose a data-driven information criterion to select the tuning parameter, which is shown to be consistent with probability approaching to 1. Simulation study is carried out to access the performance of our procedure and an example is given.

Partial Correlation Screening for Estimating Large Precision Matrices, with Applications to Classification

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Abstract: We propose Partial Correlation Screening (PCS) as a new row-by-row approach. To estimate the i-th row of Ω, $1 \le i \le p$, PCS uses a Screen step and a Clean step. In the Screen step, PCS re-cruits a (small) subset of indices using a stage-wise algorithm, where in each stage, the algorithm updates the set of recruited indices by adding the index j that has the largest empirical partial correlation (in magnitude) with i, given the set of indices recruited so far. In the Clean step, PCS rst re-investigates all recruited indices in hopes of removing false positives, and then uses the resultant set of indices to reconstruct the i-th row of Ω.PCS is computationally efficient and modest in memory use: to estimate a row of Ω,it only needs a few rows (determined sequentially) of the empirical covariance matrix. This enables PCS to execute the estimation of a large precision ma-trix (e.g., p = 10K) in a few minutes, and open doors to estimating much larger precision matrices. We use PCS for classification. Higher Criticism Thresholding (HCT) is a recent classifier that enjoys opti-mality, but to exploit its full potential in practice, one needs a good estimate of the precision matrix. Combining HCT with any ap-proach to estimating Ω gives a new classifier: examples include HCT-PCS and HCT-glasso. We set up a general theoretical framework and show that in a broad context, PCS fully recovers the support of Ω and HCT-PCS yields optimal classification behavior. Our proofs shed interesting light on the behavior of stage-wise procedures.

Influence diagnostics in log-linear integer-valued GARCH models

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Abstract: Integer-valued generalized autoregressive conditional hete-
roscedasticity (GARCH) models have played an important role in time series analysis of count data. To model negatively autocorrelated time series and to accommodate covariates without restrictions, the log-linear integer-valued GARCH model has recently been proposed as an alternative to the existing models. In this paper, we study a local influence diagnostic analysis in the log-linear integer-valued GARCH models. The
slope-based diagnostic and stepwise curvature-based diagnostics in a framework of the modified likelihood displacement are proposed. Under five perturbation schemes the corresponding local influence measures are derived. Two simulated data sets and a real-world example are analyzed to illustrate our method. In addition, the fitted model for this example has a negative coefficient for one of the two covariates, which is particularly illustrative of the extra flexibility of the considered model.

Keywords Log-linear integer-valued GARCH models · Slope-based diagnostics · Stepwise local influence analysis · Perturbation scheme

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Unified Speed Estimation of Various Stabilities

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Abstract: In probability theory, there are several different types of ergodicity,the ordinary ergodicity, the algebraic ergodicity, the exponential ergodicity, and the uniform (strong) ergodicity. In the non-ergodic case, there are in parallel different types of decay. A lot of criteria/sufficient conditions are known for these stabilities /instabilities. If one goes further asking for the speed of these stabilities/instabilities, then the known results are very limited. A subject knowing the stabilities only without knowing their speed is certainly incomplete. Motivated from the study on phase transitions and random algorithm, we have studied the speed estimation for more than two decades. This talk is concentrated on birth—death processes, we present our recent progress on the problem. An unexpected unified result is presented. In details, we present the basic estimates for the convergence rates: the upper and lower bounds are the same up to a universal constant 4 (or 2) in various different situations. The

birth—death matrix is a typical tridiagonal matrix and the algorithm of matrix eigenvalue in the computing science can be often reduced the tridiagonal one. In this sense, our new result is an addition to the matrix theory. The talk is based on the following recent papers.

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{\it Bilateral Hardy-type inequalities}.
Acta Math Sin Eng Ser. 29(1): 1--32.

[3] Chen, M.F. (2015).
{\it Criteria for discrete spectrum of 1D operators}.
Commu. Math. Stat. ???

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{\it Mixed principal eigenvalues in dimension one}.
Front. Math. China, 8(2): 317--343.

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{\it Mixed eigenvalues of discrete {p\,}-Laplacian}.
Front. Math. China, 8(2): 317--343.

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{\it Mixed eigenvalues of {p\,}-Laplacian}.
Front. Math. China, 8(2): 317--343.

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Commu Math Stat 2: 17--32.

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{\it Discrete Hardy Inequalities {\rm(II)}}.
Preprint.

Functional Law of Iterated Logarithm for Single Server Queue

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Abstract: For GI/G/1 queue, we transfer the problem of the law of iterated logarithm for queue length process, busytime process and the workload process into problems related to reflected Brownian Motion. By using properties of reflected Brownian

Motion, we get the functional law of iterated logarithm forqueue length process, busy time process and the workload process and determine the parameters. The method based on strong approximation can be applied for multi-class queue network.

Efficient Coupling for a Random-Walk Like Process

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Abstract: What can one say on convergence to stationarity of a finite state Markov chain that behaves ``locally" like a nearest neighbor random walk on the integer lattice ? The model we consider is a version of nearest neighbor lazy random walk on the state space 0,1,...,N: the probability for staying put at each site is 1/2, the transition to the nearest neighbors, one on the right and one on the left, occurs with probability 1/4 each, where we identify two sites, a and b as, respectively, the neighbor of 0 from the left and the neighbor of N from the right (but 0 is not a neighbor of a and N is not neighbor of b). This model is a discrete version of diffusion with redistribution on an interval studied by several authors in the recent past, and for which the exponential rates of convergence to stationarity was computed analytically, but had no intuitive or probabilistic interpretation, except for case where the jumps from the endpoints are identical (or more generally have the same distribution). We study convergence to stationarity probabilistically, by finding an efficient coupling. The coupling identifies the ``bottlenecks" responsible for the rates of convergence and also gives tight computable bounds on the total variation norm of the process between two starting points. The adaptation to the diffusion setting is straightforward. Based on joint work with Hugo Panzo and Elizabeth Tripp.

Nonlinear Markov Processes in Big Networks

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Abstract: Recently, various big networks are developed from, such as, computer

networks, internet of things, cloud computation, manufacturing systems, transportation networks, healthcare systems and so on. When applying the mean-field theory to analyze the big networks, this paper sets up a broad class of nonlinear continuous-time Markov processes. First of all, this paper proposes an algorithmic R-measure method for computing the fixed points of the nonlinear Markov processes by means of the UL-type RG-factorization. Then this paper uses the fixed points to further consider the local stability and metastability of the nonlinear Markov processes corresponding to the big networks. Finally, some examples of practical big networks are provided to show that these results given in this paper are useful and effective in the study of big networks.

A Critical Account of Perturbation Analysis of Markov Chains

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Abstract: Perturbation analysis of Markov chains provides bounds on the e_ect a change in the Markov transition matrix has on the corresponding stationary distribution. This paper compares and analyzes bounds found in the literature and provides a new bound. In our analysis, we provide for the first time an analysis on the relative error of bounds. Specically, we show that condition number bounds have a non-vanishing relative error as the size of the perturbation tends to zero. Our new perturbation bound will have the desirable feature that the relative error vanishes as the size of the perturbation tends to zero. We discuss a series of examples to illustrate applicability of the various bounds. For example, we address the question on how the bounds behave as the size of the system grows.

Keywords:
Markov chains, perturbation bounds, condition number, strong stability, series expansion, queuing

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The accurate computation of the key properties of

Markov chains and Markov renewal processes

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Abstract: Based upon the Grassman, Taksar and Heyman algorithm [1] and the equivalent Sheskin State Reduction algorithm [2] for finding the stationary distribution of a finite irreducible Markov chain, Kohlas [3] developed a procedure for finding the mean first passage times (MFPTs) (or absorption probabilities) in Markov renewal processes. The method is numerically stable as it doesn't involve subtraction. It works well for focusing on the MFPTs from any state to a fixed state but it is not ideally suited for a global expression for the MFPT matrix. We present some refinements to the Kohlas algorithm that we specialize to the case of Markov chains. We utilise MatLab to find expressions for the MFPT matrix. A consequence of our procedure is that the stationary distribution does not need to be derived in advance but is found from the MFPTs. This also leads to an expression for the group inverse of I - P where P is the transition matrix of the embedded Markov chain. Some comparisons, using some test problems from the literature, with other techniques using generalized matrix inverses and perturbation techniques are also presented. References: [1] Grassman W.K., Taksar M.I., and Heyman D.P., Regenerative analysis and steady state distributions for Markov chains, Oper. Res. 33, (1985), 1107-1116. [2] Sheskin T.J., A Markov partitioning algorithm for computing steady state probabilities, Oper. Res. 33 (1985), 228-235. [3] Kohlas J. Numerical computation of mean first passage times and absorption probabilities in Markov and semi-Markov models, Zeit fur Oper Res, 30, (1986), 197-207.

Testing structure of the dispersion matrix

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Abstract: Assume we have a sample of size n from a p-dimensional population with first four finite moments. We are interested in testing some basic hypothesis about the covariance structure in the dispersion matrix Σ. We are concentrating to the sphericity test and the uncorrelatedness test in the situation when both, the sample size and the

number of variables can be large. As motivated in Srivastava (2005) we can not rely on maximum likelihood tests in this framework.
For the test of sphericity we derive asymptotic expansion of a test-statistic constructed via trace functions of the sample dispersion matrix and find its asymptotic normal distribution under null-hypothesis. For the uncorrelatedness test a chi-square test-statistic is constructed.
In a simulation study probabilistic behaviour of these test-statistics is studied and speed of convergence to the asymptotic distributions examined.

Reference:
Srivastava, M. S. (2005). Some tests concerning the covariance matrix in high dimensional data. J. Japan. Statist. Soc. 35 251-272.

A semiparametric model for trajectory analysis with an application to height of Finnish children

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Abstract: This paper focuses on trajectory analysis that applies finite mixture modeling to longitudinal data. The paper introduces new modeling tools using semiparametric regression methods. A normal mixture is proposed such that the model contains one smooth term and a set of possible linear predictors. Model terms are estimated using a penalized likelihood method with the EM-algorithm. The paper also introduces a computationally appealing alternative that provides an approximate solution using ordinary linear model methodology developed for mixture regression and trajectory analysis. Simulation experiments and a real data example of height curves of 4,223 Finnish children illustrate the methods.

Key words: Curve Clustering, EM-algorithm, FiniteMixtures, Growth Curves

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Score test for a separable covariance structure with the _rst

component as AR(1) correlation matrix and its performance comparison with the likelihood ratio test

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Abstract: The problem of testing the separability of a covariance matrix against an unstructured variance covariance matrix in the context of multivariate repeated measures data is studied. Rao's score test (RST) statistic [1] is developed with the first component as an autoregressive of order one (AR(1))correlation matrix for this purpose under the as-sumption of multivariate normality. Simulation studies are conducted for the purpose of sample size consideration, and for the estimation of empirical percentiles of the null dis-tribution of RST statistic as well as that of the likelihood
ratio test statistic. Both tests are implemented with data
sets from medical studies.

Keywords: Empirical null distribution; Likelihood ratio test; Maximum likelihood estimates; Rao's score test; Separable covariance structure.

References:

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To balance or not to balance

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Abstract: Low response rate characterizes nowadays sample surveys. Furthermore, the resulting response set is biased. Special adjustment methods are needed to reduce

the bias in the estimates. The necessary auxiliary information is not always available, or not powerful enough.

In last years, balance of the response set has become a study issue. It is measured by a distance between multivariate means of auxiliary variables in a response set and in a sample. For distance zero or nearly zero, the response is balanced.

There are methods to intervene during data collection to get nearly balanced response: The Threshold method, the Equal proportions method (Särndal and Lundquist, 2014). But the effect of this activity for the estimation phase is still unknown. The question is whether estimates from the balanced response set are more accurate than the estimates from the unbalanced one in case the same auxiliary information is used (or variations of auxiliary information). A joint study by Särndal, Lumiste, Traat (2015) gives an indication that balancing the response set is worth the efforts – it protects against highly biased estimates. The results are delivered in the presentation.

References

Särndal, C.E. and Lundquist, P. (2014). Accuracy in estimation with nonresponse: A function of degree of imbalance and degree of explanation. *Journal of Survey Statistics and Methodology,* 2, 361-387.
Särndal, C.E., Lumiste, K., Traat, I. (2015). Reducing the response imbalance: Does it improve the accuracy of the survey estimates. Submitted.

Block Circular Matrices in Multivariate Normal Models

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Abstract: In this talk block circular matrices which can be used to model dependence structure of hierarchical or multilevel data are considered. Several spectral properties of circular symmetric Toeplitz matrices will be outlined which are useful for inference about these models. Special focus is on matrices having Kronecker structure since they arise in many applications for modelling spatio-temporal data. Furthermore, estiMa-
bility of variance-covariance components of such matrices will be discussed.

Strong Stability Bounds for Queues

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Abstract: This paper investigates the M/M/s queuing model to predict an estimate for the proximity of the performance measures of queues with arrival processes that are slightly different from the Poisson. Specifically, we use the strong stability method to obtain perturbation bounds on the effect of perturbing the arrival process in the M/M/s queue. Therefore, we build an algorithm based on strong stability method to predict stationary performance measures of the GI/M/s queue. Some numerical examples are sketched out to illustrate the accuracy of the proposed method.

Keywords: Queues; Strong stability method; Perturbation bounds; Algorithm.

Linear Switching Systems as a Model of the Cards Shuffle

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Abstract: The problems we consider in this talk arose in a probabilistic treatment of card shuffling. However we treat them as stochastic discrete time switching systems. When a deck of n cards is used the state space has n! elements so that for even small n the problem becomes intractable. We show that we can reduce the dimension of the state space first to the number of partitions of n into non-negative integer parts and then using this we reduce the state space to size n for the transposition shuffle. We demonstrate the procedure in this talk with decks of size 6 and 20.We define a large set of permutations and our goal in the shuffle is to hit this set. Using standard stochastic process theory we make this.

Markov Aging, Physiological Age and Phase-Type Law of Mortality

M. Govorun, B. L. Jones, X. Liu, D. A. Stanford

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Abstract: Markov Aging, Physiological Age and Phase-Type Law of Mortality M. Govorun, B. L. Jones, X. Liu, D. A. Stanford Lin and Liu (2007) proposed a finite-state Markov process with one absorbing state to model human mortality. A health index called physiological age is introduced and modeled by the Markov process. Under this model the time of death follows a phase-type distribution. In this paper, we show how an extended phase-type aging model can be used to quantify the impact of health observations on probabilities of the physiological age of an individual. We illustrate our model using health cost data, and we investigate the impact of an observed health cost on the distribution of an individual's physiological age. The resulting distributions of physiological age and future life expectancies are investigated. Their behaviours conform with our intuition and confirm the value of this approach to using past health information in modelling the future lifetime and future health of an individual. Matrix analytic tools are extensively used in this application.

The statistical analysis of recurrent event process with adjusting for confounding effects of dependent observation process

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Abstract: Recurrent event data usually occur in long-term studies which concern recurrence rates of certain events. In some circumstances of these studies, subjects can only be observed at discrete time points rather than continuously and thus only the numbers of the events that occur between the observation times, not their occurrence times, are observed. This type of data can also be referred to as interval-censored recurrent event data, or panel count data. In panel count data, the observation times or process may differ from subject to subject and more importantly, may contain relevant information about the underlying recurrent event process, therefore can be viewed as dependent observation process. Methods have been proposed for regression analysis of interval-censored recurrent event data, but most of the existing research focuses on situations where observation times are independent of longitudinal response variables given covariates. However, the independence assumption may not hold. Among others,

some inference procedures were also proposed by incorporating observation history into the statistical regression models for recurrence event process. However, confounding bias may arise due to the dependence of observation process on covariates. That is, recurrent event process, observation times and covariates may mutually be correlated. Therefore, we propose statistical analysis of recurrent event process with adjusting for confounding effects caused by dependent observation process. The results of this research will serve as new methodologies for analyzing interval censored recurrent event data with dependent observation process, without producing confounding bias.

Bootstrap for Quasi Stationary Distributions

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Abstract: Research on quasi stationary distributions , is a very important research topic. When the sample size is not sufficiently large, the asymptotic results of the general parameter method, may not hold. The bootstrap method which is introduced to solve it, avoids this disadvantage. We give the approximation form of it, and study the approximation property. Simulations are presented to illustrate the method, using two examples, the method shows to be efficient when the small sample is presented. At last, an application in a pure-death chain is discussed, together with some results.

Keywords: bootstrap validity, quasi stationary distributions, confidence band.
MSC (2010): 62F40, 60J22, 65C40.

Bayesian Covariance Modelling of Big Tensor-Variate Data Sets & Inverse Non-parametric Learning Of the Unknown Model Parameter Vector

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Abstract: Tensor-valued data are being encountered increasingly more commonly, in the biological, natural as well as the social sciences. The learning of the unknown model parameter vector given such data,involves covariance modelling of such data, but this can be difficult owing to the high-dimensional nature of the data, where the numerical challenge in such modelling can only be compounded by largeness of the data set. Assuming such data to be modelled using a correspondingly high-dimensional Gaussian Process, the joint density of a finite set of such data sets is then a tensor normal distribution,with density parametrised by a mean tensor and the k covariance matrices. When aiming to model the covariance structure of the data, we need to estimate the covariance matrices. We present a new method in which we perform such covariance modelling by first expressing the probability density of the available data sets as tensor-normal, i.e. the likelihood (of the unknown matrix and tensor-variate parameters of the GP that the data is modelled using, given the data) is tensor-normal. We then invoke appropriate (vague) priors on these unknown parameters and express the posterior of the unknowns given the data. We sample from this posterior using an appropriate variant of Metropolis Hastings. In order to reduce computational burden, the mean tensor is estimated by maximum likelihood estimation in a pre-processing step. We perform empirical illustration of the method using large three-dimensional astronomical and economic data sets of size N times M times P. To begin with, we choose to work with the squared exponential covariance function, leading us to learn (from the data), the correlation length-scales. Although the difficulty of learning the covariance model is reduced by the undertaken steps, inference with MCMC on these large, high-dimensional data sets is still time and resource intensive. This motivates us to use an efficient variant of the Metropolis-Hastings algorithm--Transformation based MCMC--employed to perform efficient sampling from a high-dimensional state space. In further applications, other kinds of covariance functions will be discussed as well. Once we perform the covariance modelling of such a data set, we will learn the unknown model parameter vector at which a measured (or test) data set has been obtained, given the already modelled data (training data), augmented by the test data.

On the James-Stein Estimator for the Multivariate Linear Regression Model

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Abstract: In this paper, we address the open problem on the James-Stein estimation for multivariate linear regression models. Under the canonical risk function or the mean-squared error, we derive an oracle James-Stein estimator, present an adaptive James-Stein estimator and propose the concepts of left and right James-Stein estimators for multivariate situations. We claim and prove the nonexistence of the traditional James-Stein estimator for multivariate situations in the whole parameter space. We also provide the lower bound of the risk for all James-Stein type decisions. As a substitute of the James-Stein estimator, we construct a combination estimator for mean matrix for multivariate linear regression models by absorbing the advantages of left James-Stein and modified Stein estimators. The risk comparisons through finite sample simulation studies illustrate that the proposed combination estimator has a much better risk than the existing estimators. A real data set is analyzed to demonstrate the proposed methodology.

Evaluation of asymptotic regression parameters tests for the proportional hazards model with delayed entries

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Abstract: Methods of survival analysis (e.g., the Cox proportional hazards model) require that the event time be measured with respect to some origin time. The choice of origin time is substantively important because it implies that the risk of the event varies as a function of time since that origin. Ideally, the origin time is the same as the time at which observations begin, on the other hand, observations do not begin until some time after the origin time. These late entries are treated as left truncated data in the statistical literature.

In the contribution, we focus on the problems of testing the hypotheses about regression parameters for the Cox proportional hazards model. There are three asymptotic tests that are commonly used to test the hypothesis that a covariate has no effect. These are Wald test, the score test and the likelihood ratio test. Under the null

hypothesis, all these tests have asymptotically the chi-squared distribution with the same degrees of freedom.

The aim of the contribution is to discuss the accuracy of p-value and power of mentioned tests. By simulations, we will investigate their behaviour for survival time simulated from Weibull and Exponential distributions and whether the behaviour depends on censoring and left truncation.

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Comparison of facial recognition methods based on extension methods of Principal Component Analysis

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Abstract: The human face recognition system becomes more and more universal in different parts of our society like governments, banks and social welfare. How to improve the efficiency of the discrimination of human face is the most significant issue in the human face recognition system. And it is also a hot issue in the high dimensional analysis.In this paper, we compared the performance of the facial recognition of three methods, EMPCA, Sparse PCA and Kernel PCA. These three methods based on the general idea of Principal Component Analysis and Fisher's Linear Discriminant. Our study based on the ORL face data base. EMPCA used same idea of the classic PCA by using the EM algorithm. The Sparse PCA extends the classic PCA by adding sparsity constraint in order to explain the variables more clear. The Kernel PCA extends the classic PCA by using kernel methods. The comparison of these three methods in facial recognition can help us know much more about the applications of the dimension reduction methods.

On matrix D-stability and related properties

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Abstract: In this paper, we study the localization of matrix spectra inside a given sector of the complex plane, including matrix stability and eigenvalue positivity. We mainly focus on matrices whose spectral properties remain the same under multiplication by a positive diagonal matrix D. We study the conditions of matrix D-stability and D-positivity. New criteria of the invariance of matrix spectra losalization in terms of nested sequences of principal submatrices are presented.

Comparison of unbiased estimators using Pitman's measure of closeness

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Abstract: In this paper, under the assumption of normality, we give the comparison of unbiased estimator under the Pitman's measure of closeness (PMC). Its applications in linear regression are also discussed.

Adjacency and coherency preservers

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Abstract: We will present several recent results on the structure of adjacency and

coherency preservers on hermitian matrices. Applications in mathematical physics will be discussed.

Teaching Matrices within Statistics

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Abstract: Every statistician needs matrices in some form, both in theoretical and practical challenges. Learning the necessary skills requires time and work, as the multidimensional concept of matrix is far from trivial for most students entering the university.Quite often students of Statistics face matrices for the first time on an elementary course of linear algebra, because it is typically thought that Mathematics should take the responsibility of teaching those topics to everyone. Unfortunately, as the approach on such courses is often quite mathematical, and the connection to Statistics and its applications more or less hidden, it may be rather difficult to find the required motivation for studying the secrets of matrices. However, a certain kind of enthusiasm for matrices should be kindled on the very first course introducing the subject. Therefore, the future statisticians deserve their own courses that do not forget about the theoretical aspects of matrix theory, but instead of too many mathematical details focus on computational approach with appropriate software to investigate real-world applications. In this talk and the mini-symposium we consider various examples of applications and approaches where matrices play a significant role and wonder how to teach matrices within Statistics.

Applications of matrix decompositions in Survo R

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Abstract: Matrix computations form a core for many of the traditional multivariate statistical methods. Especially the matrix decompositions, such as singular value decomposition, have turned out to be very useful also from the application point of

view. Principal components analysis is one example. Quite recently it has been demonstrated how exploratory factor analysis can be considered as specific data matrix decomposition with fixed unknown matrix parameters. In this so called direct factor analysis approach all model unknowns including common and unique factor scores are estimated simultaneously by minimizing a specific object function with an alternating least squares (ALS) algorithm utilizing singular value decomposition (SVD) of data matrices. Such technique also allows performing factor analysis in cases with more variables than observations. Other useful matrix decompositions for the pragmatic data-analyses are the CUR decompositions, in which a low-rank matrix approximation is based on a small number of actual columns of the data matrix. The utility of this approach is that the interpretations of the results of an application are straightforward. Practical application of such techniques requires appropriate tools for the analyses. We demonstrate the methods and their implementation using the Survo R system that allows to freely mix natural language and computation schemes in so called editorial environment.

Adjustment for Covariate Measurement Errors in Complex Surveys

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Abstract: In this paper we investigate methods for adjustment for covariate measurement errors in complex surveys. Focus is on the adjustment for covariate measurement errors in logistic regression for cluster correlated data. Complexity in this situation arises from correlation of observations due to cluster sampling. The adjustment methods which will be studied are Multiple Imputation and Regression Calibration. Some information about the measurement error must be available. This information is provided from validation study data.

An interesting approach dealing measurement errors is multiple-
imputation for measurement errors (Cole et al., 2006; Padilla et al., 2009). In this approach measurement errors are treated as a missing data problem. Regression Calibration method is widely applied and studied (Rosner et al., 1989; Kuha, 1994; Spiegelman et al., 2000, 2001; Messer and Natarajan, 2008; Skrondal and Kuha, 2012). Regression calibration is a statistical method for adjusting point and interval estimates for bias due to measurement error. There is an extensive literature on covariate measurement error adjustment for independent observations. Much less is

reported to covariate measurement error adjustment in cluster correlated data.

An extensive Monte Carlo simulation studies is conducted. The properties of the multiple imputation and regression calibration approaches was investigated and preliminary results was introduced in papers by Valaste et al. (2010a,b); Valaste, 2015. Artificial data will be generated based on Finnish ECHP data, where the variables of interest such as income are measured both by interview and by administrative registers. The Monte Carlo experiment uses a design-based simulation for real cluster-correlated data. The experimental designs are arranged so that some of the parameters are fixed, while a part of them are varied. This allows the statistical properties of the methods to be studied and compared.

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Comparison and diagnostics of various latent variable models in social sciences

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Abstract: Different kinds of questionnaires are usually applied in a field of social sciences. The basic interest of these studies is often to reveal the underlying construct which is measured by different set of specific questions. Usually the construct of measurement instrument is examined using latent variable model e.g. exploratory or confirmatory factor analysis, (multidimensional) item response models (Bock, Gibbons & Muraki, 1988), latent class or latent profile analysis (Goodman, 1974), depending on the measurement level of observed variables and the assumptions of underlying model. Although the latent variable models are well known and usually part of basic methodological curriculum, many still struggle with estimation problems e.g. Haywood cases and non-identifiability. To identify the cause of these problems one must carefully examine the huge number of different result matrixes, which can be rather difficult in most commercial software. At the same time different models can lead to similar results and it's often difficult to choose which model is best for specific problem or data.

In this presentation I'll show how Survo-R environment (Sund, Vehkalahti & Mustonen, 2014) might help researcher to solve different computational issues, which usually arise when one is trying to analyze real word data leading to a better understanding of underlying model. Survo –R is a powerful editor of an R-programing language (R Core Team, 2013) which is of the most widely used statistical environment.

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Network analysis of questionnaire data

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Abstract: In the human sciences, the way people think, feel and act is thought to reflect their psychological properties. Data is often gathered using questionnaires, and different forms of factor analysis are used as the default analysis method. Factor analysis is based on the idea that the covariation of variables related to different forms of human behavior reflects the underlying psychological properties. But could we do without latent variables? In this presentation, I discuss the results of modeling data from a psychometric questionnaire as a Markov Random Field (MRF), in which the different forms of behavior function as random variables.

The analysis is based on forming an undirected, weighted network that is encoded in a weights matrix. As a first stage of the analysis - and not yet related to MRFs - it is beneficial to use raw correlations among the variables as weights and to represent the weights matrix as a graph. Correlations can be used as weights because correlations are undirected and weighted entities, with zero correlation representing no relationship. This first step is useful for obtaining an overall understanding of the interrelationships of the variables in the data. The correlation matrix, however, suffers from the problem of confounding: the observed correlation between any two variables may be due to both of them being related to one or more other variables in the data. Because of this, as the second stage of the analysis, a partial correlation matrix is calculated. This matrix is directly related to the inverse of the correlation matrix, and can be calculated through the use of several linear regressions. Under the multivariate normality assumption, two variables are conditionally independent if their partial correlation (conditioning on all other variables included in the network) is zero. This applies at the population level, but in the sample data exact zeroes are unlikely. For this reason, the partial correlations are calculated based on estimating the corresponding regression models using the adaptive least absolute shrinkage and selection operator (adaptive LASSO) estimator. In adaptive LASSO estimation, a penalized likelihood is maximized, with the penalty being based on the value of the extended Bayesian Information Criterion (eBIC). Small partial correlations then shrink to zero with the aim of converging on the hypothesized population-level Markov Random Field model.

The network thus formed can be described using various centrality and clustering coefficients. When working with weighted networks, many of these coefficients can be calculated based on the connection weights, even though they were originally formulated for the non-weighted case. The issue of calculating the value of such coefficients based on either the presence of connections or their weights is discussed. Finally, from the teacher's perspective, the network models show promise as a teaching tool in the behavioral sciences: the graphs can be used as a visual tool that allows the students to obtain an intuitive understanding of high-dimensional, complex data.

Keywords: Network analysis, correlation matrix, partial correlation matrix, Markov Random Field, adaptive LASSO

Studying the different properties of MIN and MAX matrices - a student-friendly approach

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Abstract: The $n \times n$ -matrix with $\min(i, j)$ as its ij entry is the so-called MIN matrix of the set $\{1, 2, ..., n\}$ .In fact, this particular matrix is, up to a positive scalar, the covariance matrix of a stochastic process with increments which possess the same variance and are uncorrelated. This same matrix has also been studied by R. Bhatia [?], as he gives six different proofs for its positive definiteness. Similarly, the MAX matrix of the set $\{1, 2, ..., n\}$ is the $n \times n$ matrix with $\max(i, j)$ as its ij entry.

It turns out that MIN and MAX matrices are rather simple special cases of so-called meet and join matrices, and the theory developed for meet and join matrices can easily be applied to MIN and MAX matrices. We will learn how to factorize MIN and MAX matrices and we shall also obtain formulas for the determinants and inverses of these matrices. And finally, we are going to see the reason why every real and positive Hadamard power of a MIN matrix is always positive definite, but every real and positive Hadamard power of a MAX matrix is indefinite.

What makes this presentation interesting from a student's point of view is that many

of the results may be obtained by only using elementary methods and techniques. For example, the determinants of MIN and MAX-matrices may be calculated quite easily by making use of the Gauss-Jordan elimination process.

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Applying the quasi-multinomial distribution

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Abstract: Privacy concerns on data drive an applied field of statistics: Statistical Disclosure Control or Limitation (SDC or SDL). This field requires modeling of a contingency table to assess the risk of the identification of an individual. Some practical reasons confine this type of modeling, where a contingency table is subject to a class of distributions. This talk presents the quasi-multinomial distribution from this class, and shown are some properties such as its variance covariance matrix.

A family of mixed INAR(1) time series model with applications

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Abstract: This paper presents a family of models for a stationary non-negative first order integer-valued random variables based on the Pegram and thinning operators. Some fundamental and regression properties, k-step-ahead conditional probability have been obtained. Maximum likelihood estimation by the EM algorithm is applied

to estimate the parameters. Comparative study of the proposed model with the thinning and Pegram models has also been conducted. The Fisher information matrix has been derived to estimate the asymptotic distributions of the parameters. Comparison with existing models by AIC showed that the proposed model is much better and illustrates its potential usefulness in empirical modelling. Real count data sets have been used to illustrate its application and the model with Poisson marginal is considered for forecasting.

On an IPM-type method for determining predictions and estimated prediction error dispersions

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Abstract: In this talk we have a focus on the prediction problem within the framework of the general possibly singular Gauss-Markov model. Based on results of the powerful theory of generalized inverses, we discuss an
IPM-type method for determining predictions and estimated prediction
error dispersions.

Keywords: G-inverse, linear model, IPM method, prediction

Generalized Difference-based Weighted Mixed Almost Unbiased Liu Estimator in Partially Linear Models

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Abstract: In this paper, a generalized difference-based estimator is introduced for the vector parameter β in partially linear model when the errors are correlated. A generalized difference-based almost unbiased Liu estimator is defined for the vector

parameter β. Under the linear stochastic constraint $r=R\beta+\epsilon$, we introduce a new generalized difference-based weighted mixed almost unbiased Liu estimator. The efficiency properties of the difference-based weighted mixed regression method is analyzed. Finally, the performance of the new estimator is illustrated by a simulation study.

Generalized inverses and matrix space

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Abstract: This presentation considers the application of Moore-Penrose generalized inverses in the expressing matrix spaces including the span of the products of the columns of one matrix and the rows of another matrix, the Kernels of matrix linear transformations, and the orthogonal compliments of matrix linear spaces. As the implications, the general forms of the solution sets to homogeneous matrix equations, the projections onto matrix spaces, and the collections of all least square solutions to linear matrix equations are obtained. Based on these results the relations of the collections of various generalized inverses are revealed.

Leontief's Input-Output Representation of Least Sqaures Estimators of Simple and Multiple Regression Coefficients

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Abstract: First, we show analytically that the nexus between Least Squares (LS) estimators of multiple and simple regression coefficients are exactly the same as between partial and total derivatives of the general function of a given number of independent variables. Second, LS estimators of multiple and simple regression coefficient vectors correspond, respectively, to net output and gross output vectors in Leontief's input/output matrix equation where the input coefficient matrix is composed of LS estimators of the coefficients in simple regression equations that can

be formed from the given number of regressors. Third, we show that each element of LS estimator of multiple regression coefficient vector is represented by Cramer's rule. Finally, we show that LS estimator of each multiple regression coefficient as represented by Cramer's rule can be transformed to its counterpart in Frisch and Waugh Theorem. Thus, the fragments in regression theory are related in a unifying manner, involving the works of two Nobel laureates in Economics.

Some New results on Fukushima's decomposition and stochastic calculus

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Abstract: Let $(\varepsilon, D(\varepsilon))$ be a quasi-regular semi-Dirichlet form and $(X_t)_{t\geq 0}$ be the associated Markov process. For $u \in D(\varepsilon)_{lx}$,denote $A_t^u u(X_t) - u(X_0)$ and $F_t^u := \sum_{0<s\leq t} [u(X_s) - u(X_{s-})] I_{|u(X_s)-u(X_{s-})>1|}$ .We show that there exist a unique locally square integrable martingale additive functional Y^u and a unique continuous local additive functional Z^u of zero quadratic variation such that $A_t^u = Y_t^u + Z_t^u + F_t^u$. Further, we define the stochastic integral $\int_0^t V(X(s-))dA^u$, for $V \in D(\varepsilon)_{loc}$ and derive the related Ito's formula.

This talk is based on the cooperation with Professor Sun Wei and Professor Chen Chuanzhong

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On h-transformation of positivity preserving semigourps and their associated Markov processes

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Abstract： The h-transforms of positivity preserving semigroups and their associated Markov processes are investigated in this paper. It is shown that any quasi-regular positivity preserving coercive form is h-associated with a pair of special standard processes which satisfy Hunt-hypothesis (H).

On the Monotonicity and Boundedness of the remainder of Stirling's formula

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Abstract: In this paper, we are concerned with the monotonicity and the estimates of σ_x and λ_x defined by the famous Stirling's formula:

$\Gamma(x+1)=\sqrt{2\pi x}\left(\frac{x}{e}\right)^x \exp\left(\frac{\sigma_x}{12x}\right)=\sqrt{2\pi x}\left(\frac{x}{e}\right)^x (1+\lambda_x)(x>0)$ and improve some old results.

Key words: Stirling's formula; function; Monotonicity; Boundedness.

Groebner basis techniques for finiteness checking of finitely presented groups

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Abstract:Given a finitely presented group, it is interesting to know whether it is finite. In this talk, we first consider the corresponding group ring and map it to a free associa tive K-algebra. Then wedevelop a Groebner basis theory in this algebra. Finally we can check the finiteness of the order ofa given element in the given group and comput er its order if it is finite, and we may check the finiteness of the group as well.

Decompositions of Herz-Morrey-Hardy spaces with variable exponents and their application

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Abstract: The atomic and molecular decompositions of Herz-Morrey-Hardy spaces with variable exponents are given. As their application, the boundedness of a convolution type singular integral on Herz-Morrey-Hardy spaces with variable exponents is obtained.

Gevrey regularity for the non-cutoff nonlinear homogeneous Boltzmann equation with strong singularity

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Abstract: We study the Cauchy problem of the nonlinear spatially homogeneous Boltzmann equation without angular cutoff. By using analytic techniques, we prove the Gevrey regularity of the C^{∞} solutions in non Maxwellian and strong singularity cases.

Girsanov Transformations for Non-Symmetric Markov Processes

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Abstract: Let X be a Markov process, which is assumed to be associated with a (non-symmetric) Dirichlet form $(\varepsilon, D(\varepsilon))$ on $L^2(E;m)$. For u $\in D(\varepsilon)_e$,the extended Dirichlet space, we give necessary and sufficient conditions for the Girsanov transform to induce a positive supermartingale and hence to determine the Girsanov transformed process Y of X.Morever we present a sufficient condition under which Y is associated with a semi-Dirichlet form and give an explicit representation of the semi-Dirichlet.

Keywords: Markov process; Dirichlet form; supermartingale; Girsanov Transformation.

Nonlinear maps preserving Lie products on triangular algebras

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Abstract: In this paper we prove that every bijection preserving Lie products from a triangular algebra onto a normal triangular algebra is additive modulo centre. As an application, we described the form of bijections preserving Lie products on nest algebras and block upper triangular matrix algebras.

The Fully Entangled Fraction of Quantum States

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Abstract: Quantum entanglement plays crucial roles in quantum information processing.Quantum entangled states have become the key ingredient in the rapidly expanding field of quantum information science. We investigate the general characters of the fully entangled fraction of bipartite quantum state.

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An Introduction to Hainan Normal University

Hainan Normal University is an academic institution in the process of applying for the right to confer PhDs ratified by the Academic Degrees Office of the State Council, and a school that received an "excellent" rating in the nationwide evaluation of undergraduate education monitored by the Ministry of Education. Founded in the autumn of 1949, the university is a key provincial university with a long history, distinctive teacher education and fairly good overall strength. It is located in Haikou City, a beautiful city for seaside tourism with a renowned history and culture.

The university now has 17 schools, 26 scientific research institutions, 10 Class-1 master's degree programs, 3 Class-2 master's degree programs, 1 professional master's degree program for education, 45 undergraduate programs, 5 key provincial disciplines and 3 provincial research bases for humanities and social sciences. It now boasts 836 full-time teachers, of whom 488 are professors or associate professors, and 537 of which have at least a master's degree (this number includes 170 PhDs). Moreover, our school's teachers include one national "Expert with Outstanding Contributions", one expert chosen in the first group of the national "Talented Individuals of the New Century", four candidates chosen for the Ministry of Education's "Subsidy for Exceptionally Talented Individuals" project, three national Model Teachers, two recipients of the national May 1st Labor Medal, one national Excellent Teacher, twenty-three experts who receive special subsidies from the State Council, and thirty-seven provincial "Excellent Experts with Outstanding Contributions in Hainan".

The university now accommodates 3 campuses—the South Longkun Road campus, the Guilinyang campus and the Lingshan campus, covering an area of 1,500,000 square meters. With 110,320,000 Yuan worth of teaching and scientific research equipment, it is home to thirty-two labs, including one key lab co-funded by Hainan Province and the Ministry of Education, one key provincial lab, and five provincial

demonstration centers for experimental teaching. The university now has 187 internship bases for various purposes, and the university library has a collection of 1,520,000 paper books and 1,200,000 e-books.

The university enrolls students from 30 provinces (including municipalities and autonomous regions), and now has a student population of over 20,000, of whom 477 are postgraduate students, 15,096 are full-time undergraduates and 112 are foreign students. The school's graduates are well received in society because of their solid foundation, high quality and strong level of competence. Across Hainan, over 80% of middle school teachers, and 90% of school principals, teachers with special classification, and keynote teachers are graduates of our university, earning it the reputation of being "an elite school in Hainan and a cradle for teachers".

In recent years, having oriented itself to retain a firm foothold in Hainan while keeping the entire country in view and spreading its influence to Southeast Asia, the university has brought into full play its advantage of being in the proximity of Hong Kong and Macao and of being a popular destination for Southeast Asian people. The university has actively expanded its academic exchange and cooperation efforts. So far, it has established friendly relations with 35 universities and educational institutions abroad, and has collaborated with 5 universities in student-training. In 2007, the university set up a Confucius Institute, the first of its kind in Indonesia, in joint collaboration with the Chinese Language Education Center in Jakarta, Indonesia. 2009 witnessed the setup in our university of the Southeast Asian Teacher-training Base for the Promotion of Chinese, under the approval of Hanban/Confucius Institute Headquarters, which is the only main construction base of Hanban in southern China at present.

At this new historical starting point, the university will continue to adhere to its educational model of "bettering the school with qualified personnel, improving the school with quality education, upgrading the school with academic achievements, and establishing the school with distinctive features". It seeks to seize the opportunity and take the initiative in innovating and constantly improving its educational level and strength, actively contributing the construction of the international tourism island, and endeavoring turn itself into a normal university with widespread public approval.

An Introduction to the School of Mathematical and Statistics

The School of Mathematics and Statistics of Hainan Normal University was founded in 2008. It is one of the oldest faculties of the university, and its predecessor is the Department of Mathematics of the National Hainan Teachers College (renamed Hainan Normal University by the approval of Ministry of Education in 2007) established in 1949. The School of Mathematics and Statistics started undergraduate education in 1983, and gained the master degree granting right for pure mathematics in 2004, which makes it one of the first four faculties of the university gaining master degree granting rights. The school now has more than 1,200 undergraduate and graduate students.

The school consists of the departments of mathematics, statistics, information and computing science, and public mathematics teaching, and three majors for undergraduates, including mathematics and applied mathematics, information and computing science, and statistics. In 1999, pure mathematics was approved as one of the first Hainan provincial key disciplines. It is now one of sixteen key disciplines at the provincial level at Hainan. Mathematics is the key subject of the university, and gained the right for the first-level discipline for master degree granting in March 2011.

In the past five years, our faculties have been involving or directing 15 national research programs and 36 provincial research programs. Six programs are granted the Science and Technology Progress Awards of Hainan Province, and two of them won the first prizes. The faculties have published 409 academic works on notable academic journals such as Journal of Functional Analysis etc, among which 184 are indexed by SCI, EI and ISTP. Our faculties have also published 15 monographs and textbooks.

The school has a young, well-structured and high over quality faculty of 34

professional teachers and researchers, including two second-grade professors. Among them,38% hold doctoral degrees and 49 hold master's degrees. In particular, there is 1 state council expert for special allowance, 2 the first-level selected personnel of Hainnan "515"talent project, 2 excellent experts named the special contributors of Hainan, 2 commentators of Mathematical Reviews, 1 member of the council of Operations Research Society of China, 1 member of the 4th council of Chinese Society of the History of Mathematics, 1 executive council member of China Association for the International Institute for General Systems Studies, 1 executive council member of the special committee on Fuzzy Information and Engineering of Operations Research Society of China, 1 executive council member of the Education and Teaching Committee of the Chinese Society of Education,1 national model teacher, and 1 winner of Zeng Xianzi's Educational Award

The school has five laboratories for statistics, computer fundamentals, mathematical model, combinatorics and information, and the central of statistical research and statistical consultation.The library of our school has a large number of books that offer strong supports for the study of teachers and students. This library is the largest one among all the school-level libraries of the university.